BenCost

Version 4

A Computer Program for Estimating the Financial Benefits and Costs of Family Planning Programs

Spectrum System of
Policy Models

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I. Introduction

A. Description of the Spectrum System

1. Components

The POLICY Project and its predecessor projects have developed computer models that analyze existing information to determine the future consequences of today's population programs and policies.[1] The new Spectrum POLICY Modeling System consolidates previous models into an integrated package containing the following components:

Spectrum consolidates DemProj, FamPlan, Benefit-Cost, AIM, and RAPID models into an integrated package.

- **Demography (DemProj)** – A program to make population projections based on (1) the current population, and (2) fertility, mortality, and migration rates for a country or region.
- **Family Planning (FamPlan)** – A program to project family planning requirements in order for consumers and/or nations to reach their goals of contraceptive practice or desired fertility.
- **Benefit-Cost (BenCost)** – A program for comparing the costs of implementing family planning programs, along with the benefits generated by those programs.[2]
- **AIDS (AIDS Impact Model – AIM)** – A program to project the consequences of the AIDS epidemic.
- **Socioeconomic Impacts of High Fertility and Population Growth (RAPID)** – A program to project the social and economic consequences of high fertility and rapid population growth for sectors such as labor force, education, health, urbanization, and agriculture.

[1] The terms "model" and "module" are used interchangeably in the Spectrum manuals to refer to the computer programs within the system.

[2] Older versions of the benefit-cost analysis model were named "Benefit-Cost"; occurrences of this former name in the model screens are being altered to "BenCost" as the program is revised and updated. The versions of the model distributed as part of Spectrum training sessions will be standardized to "BenCost".

2. Software Description

Spectrum is a Windows-based system of integrated POLICY models. The integration is based on DemProj, which is used to create the population projections that support many of the calculations in the other Spectrum components—FamPlan, BenCost, AIM, and RAPID.

Each component has a similarly functioning interface that is easy to learn and to use. With little guidance, anyone who has a basic familiarity with Windows software will readily be able to navigate the models to create population projections and to estimate resource and infrastructure requirements. The accompanying manuals contain both instructions for users, and equations for persons who want to know exactly how the underlying calculations are computed.

B. Uses of Spectrum Policy Models

Policy models are designed to answer a number of "what if" questions. The "what if" refers to factors that can be changed or influenced by public policy.

Policy models are designed to answer a number of "what if" questions relevant to entities as small as local providers of primary health care services and as large as international development assistance agencies. The "what if" refers to factors that can be changed or influenced by public policy.

Models are commonly computerized when analysts need to see the likely result of two or more forces that might be brought to bear on an outcome, such as a population's illness level or its degree of urbanization. Whenever at least three variables are involved (such as two forces and one outcome), a computerized model can both reduce the burden of manipulating those variables and present the results in an accessible way.

Some of the policy issues commonly addressed by the Spectrum set of models include:

- the utility of taking actions earlier rather than later. Modeling shows that little in a country stands still while policy decisions are stalled and that many negative outcomes can accumulate during a period of policy stasis.
- the evaluation of the costs vs. the benefits of a course of action. Modeling can show the economic efficiency of a set of actions (i.e., whether certain outcomes are

achieved more effectively than under a different set of actions), or simply whether the cost of a single set of actions is acceptable for the benefits gained.

- the recognition of interrelatedness. Modeling can show how making a change in one area of population dynamics (such as migration rates) may necessitate changes in a number of other areas (such as marriage rates, timing of childbearing, etc.).
- the need to discard monolithic explanations and policy initiatives. Modeling can demonstrate that simplistic explanations may bear little relationship to how the "real world" operates.

A set of policies under consideration may not be acceptable to all stakeholders.

- the utility of "door openers". A set of policies under consideration may not be acceptable to all stakeholders. Modeling can concentrate on favored goals and objectives and demonstrate how they are assisted by the proposed policies.
- that few things in life operate in a linear fashion. A straight line rarely describes social or physical behavior. Most particularly, population growth, being exponential, is so far from linear that its results are startling. Modeling shows that all social sectors based on the size of population groups are heavily influenced by the exponential nature of growth over time.
- that a population's composition greatly influences its needs and its well being. How a population is composed—in terms of its age and sex distribution—has broad-ranging consequences for social welfare, crime rates, disease transmission, political stability, etc. Modeling demonstrates the degree to which a change in age and sex distribution can affect a range of social indicators.
- the effort required to "swim against the current". A number of factors can make the success of a particular program harder to achieve; for example, the waning of breastfeeding in a population increases the need for contraceptive coverage. Modeling can illustrate the need for extra effort—even if simply to keep running in place.

C. Organization of the Model Manuals

Each manual begins with a discussion of what the model does and why someone would want to use it. The manual also explains the data decisions and assumptions needed before the model can be run, and possible sources for the data. It defines the data inputs and outputs. The manual contains a tutorial, information on the methodology behind the model, a glossary, and a bibliography.

D. Information about the POLICY Project

The POLICY Project is a USAID-funded activity designed to create a supportive environment for family planning and reproductive health programs through the promotion of a participatory process and population policies that respond to client needs. To achieve its purpose, the project addresses the full range of policies that support the expansion of family planning and other reproductive health services, including:

- national policies as expressed in laws and in official statements and documents;
- operational policies that govern the provision of services;
- policies affecting gender roles and the status of women; and
- policies in related sectors, such as health, education, and the environment that affect populations.

The POLICY Project is implemented by The Futures Group International in collaboration with Research Triangle Institute (RTI) and the Center for Development and Population Activities (CEDPA).

More information about the Spectrum System of Policy Models and the POLICY Project are available from:

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E. What is BenCost?

Benefits are defined as savings in government expenditures on social services.

In recent years, a computer-based family planning benefit-cost model, originally developed by the INPLAN Project and modified under the RAPID III Project, has been applied to evaluate the financial implications of family planning programs in many African, Asian, and Latin American countries. This financial benefit-cost analysis model, known as BenCost, compares the monetary cost of family planning programs to the monetary benefits in terms of reduced levels of social services required at lower levels of fertility. In these recent applications, benefits are defined as savings in government expenditures on social services. BenCost is a module in the Spectrum policy modeling system that allows planners to add the cost of health, education, and other social services to population projections created with the DemProj and FamPlan modules. Once these costs have been added to a projection, BenCost can be used to study the long-term economic costs and benefits to society resulting from changes in family planning programs. Before describing the model further, we first provide some background on the methodology of benefit-cost analysis and its application to family planning programs.

F. Why Make Benefit-Cost Projections?

When foreign grants no longer meet the needs of publicly supported family planning programs, governments have to consider whether to increase their share in covering program costs so that they can maintain program goals. Yet as successful as these programs are in many countries at meeting the goals they set and reducing the economic burden on other sectors, some governments do not view them as sound financial investments. However, decision tools are available to help weigh the arguments. For example, existing or new studies can demonstrate both the financial and the nonmonetary benefits of family planning

programs, helping governments to reaffirm their commitments and allocate their scarce resources accordingly. Furthermore, studies or exercises estimating the degree of financial returns to the program can help planners negotiate for external loans in support of family planning programs.

Benefit-cost projections allow policymakers to ensure that they receive the maximum return on social sector investments. The BenCost model allows decision makers to assess the additional savings to future government health and education services that will result from changes in family planning programs over time. These savings could be used to improve the quality and coverage of existing programs. This model allows the analyst to ask questions such as: "What would happen to the secondary school budget requirement in 10 years if unmet family planning need were reduced by 10 percent next year?" By allowing policymakers to analyze multiple funding scenarios for family planning programs, this type of projection can aid in the formulation of sound investment decisions.

The objectives of these family planning program financial analyses are:

1. **To estimate the impacts** of family planning programs on government expenditures for social services such as health, education, housing, and food subsidies.
2. **To compare reductions** in government social services spending as a result of family planning programs to the costs of family planning services.
3. **To show the financial viability** of family planning programs and their effectiveness in improving the quality of social services.

II. Benefit-Cost Analysis and Its Applications to Family Planning

A. Principles of Benefit-Cost Analysis: Discounting

Economists routinely use benefit-cost analysis to evaluate the profitability of investment projects, such as building a bridge or a power plant, that will generate a future stream of revenues but also incur initial and subsequent costs. The more total revenues exceed total costs, the more profitable an investment project will be. Policymakers often use benefit-cost analysis to choose how to best allocate scarce funds among competing programs. A difficulty inherent in this type of analysis is that benefits may not appear until some time in the distant future, while costs generally begin accruing as soon as the project begins. To measure the true value that an investment project will yield, it is necessary to understand the concept of discounting.

The concept of discounting future economic returns in order to judge the soundness of an investment is based on the economic assumption that consumption now is always preferred to consumption in the future. If asked the question, "Which would you prefer, $100 today, or $100 in 5 years?" most people would choose the $100 today. The gift of $100 received in the future is inferior to the gift of $100 received today. In essence, the $100 gift given in the future is worth less than the $100 gift received today. The economic concept of discounting allows us to put a price on that inferiority.

For us to accurately compare future benefits to present benefits, the value of the future benefits must be reduced, or "discounted". The prevailing market rate of interest is a measure of the inferiority of future benefits relative to present benefits and can be used as the rate by which future benefits can be converted into present values. In the example above, if the prevailing interest rate is 5 percent, a $100 gift to be received in 5 years is only worth

$78.35 to someone today. This can be expressed with the following equation.

$$\frac{B_n}{(1+i)^n} = Present Value of Future Return \ ,$$

where:

B = the expected benefits in a future year *n*

i = the appropriate discount rate for annual compounding

n = the number of years in the future when the benefit will be realized.

Using the numbers in our example above, the present value of a future gift of $100 is calculated in the following manner:

$$\frac{100_{5 years}}{(1+0.05)^5} = \$78.35 \ .$$

It is easy to underestimate how strongly discounting can reduce the value of a future benefit or cost. These reductions are particularly great the further out in the future the cost or benefit will be received. For example, if we are told that a certain program will save $46 million, but the savings will not be realized for 30 years, how much value should we place on this program? Table 1 illustrates this point:

Table 1: Present Value Over Time

No. of Years in Future	Year	Amount of Benefit	Present Value
0	1999	$ 46,000,000	$ 46,000,000
10	2009	$ 46,000,000	$ 17,734,991
20	2019	$ 46,000,000	$ 6,837,607
30	2029	$ 46,000,000	$ 2,636,193

The BenCost model expands upon this principle to compare the present value of all benefits expected to be generated

by a project with the present value of all expected costs associated with the project.

The comparison can also be expressed in the following way:

$$\frac{B_1}{(1+i)} + \frac{B_2}{(1+i)^2} + \ldots \frac{B_n}{(1+i)^n} > \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \ldots \frac{C_n}{(1+i)^n} \quad ,$$

where:

$C_1, C_2, \ldots, C_n$ = the series of expected costs in year 1, 2,..., *n*

$B_1, B_2, \ldots, B_n$ = the series of expected benefits in year 1, 2,.., *n*

i = the appropriate discount rate for annual compounding.

If a particular project satisfies the inequality such that the benefits generated exceed the costs of the project, the benefit-cost ratio is greater than one. The total benefits could also be less than, or equal to, the total associated costs, depending on the actual values pertaining to a specific project.

The project that shows the highest ratio of present benefits to costs should be chosen from a possible array of competing projects.

The most important result of such an analysis is the creation of a simple, straightforward decision rule: if benefits exceed costs, the project should be undertaken.

Alternatively, the project that shows the highest ratio of present benefits to costs should be chosen from a possible array of competing projects. This simple decision rule is why benefit-cost analysis has gained so much favor in recent years for analyzing and comparing alternative investment projects.

When we turn to the application of the principle, however, we are immediately confronted with a series of issues that may complicate actual analysis. Questions arise, for example, concerning the proper enumeration of costs and benefits, the valuation of benefits, and the choice of and appropriate rate of discount. All these problems become even more important when one attempts to apply this methodology to analyze public family planning programs.

B. Applications to Public Family Planning Programs

When the principles of benefit-cost analysis are applied to family planning programs, it is crucial to define what is meant by "benefits" and to specify how they will be measured. The results of family planning analyses, and more importantly the interpretation of the results, depend heavily on how "benefits" are defined and measured. As we will see, even within the realm of family planning analysis, there are many possible ways to define benefits.

For example, the benefit of a national family planning program can be defined as the contribution it makes in improving the per capita income of the country. With the establishment of a family planning program, the fertility rate and population growth rate would be lower. Assuming that total production would remain unaffected by fertility decline in the short run and that it would increase in the long run by way of increases in savings and female labor participation, a lower fertility rate would lead to higher income per capita. This average increase in per capita income multiplied by the total population would then approximate the total economic benefit of the family planning program. Benefit-cost analysis of a family planning program based on this type of benefit definition is usually called an "economic benefit-cost analysis". Even though the debate has been renewed in recent years on the validity and significance of benefits defined in this way, a review study commissioned by the National Research Council in the United States in 1986 did support conclusions drawn from this approach (NRC, 1986).

Some would argue that the scope of benefits should be broader than income per capita. Many important noneconomic benefits—such as improvements in maternal and child health—are associated with family planning and lower fertility rates and should be included in any family planning benefit-cost analysis. This argument is correct if the benefit-cost analysis is intended to be used to formulate a population and family planning policy. But in practice it is very difficult to measure these noneconomic benefits. Even if they can be measured correctly, it still is difficult to convert them into monetary units so that they can be combined with other economic benefits.

It is also possible to define benefits in terms of the two components of income per capita: private consumption and public consumption. Given total resources available for consumption, each individual's share would increase if there were fewer people to share. On the private consumption side, resources that otherwise would have been consumed by additional people could then be used either to augment individual consumption or, better yet, to increase savings, investment, and production. On the public side, resources saved from not serving more people at the basic level could be used to improve the quality of public services for the rest.

For policy formation, obviously all benefits need to be considered and to be weighed against all costs. However, sometimes it is useful and appropriate to consider only one type of benefit. A case in point is public consumption. This is the focus of the BenCost model.

C. Public Benefit-Cost Analysis of Family Planning Programs

When benefits are defined as savings realized from offering public sector services to a smaller population, the benefit-cost study is sometimes referred to as a "public benefit-cost analysis" or "financial benefit-cost analysis". Many public services provided by the government are closely related to population size. For example, if elementary school education is compulsory, then the number of students enrolled each year will depend on the number of children in the age group 6 to 12. The larger this group of children, the higher the demand for classrooms, teachers, books, etc. Other services that are affected by population size and distribution include health, secondary and tertiary education, food subsidies, social welfare, housing, utilities, and infrastructure. Some of these relationships are direct and immediate, such as health expenditures and population; others are less direct and become apparent only after long delays, such as housing programs and population.

The main purpose of conducting a public benefit-cost analysis of a family planning program is to evaluate the financial savings to the government as a result of providing the same level of services to a smaller group of people.

The main purpose of conducting a financial benefit-cost analysis of a family planning program is to evaluate the financial savings to the government as a result of providing the same level of services to a smaller group of people. Resources "saved" theoretically can be used to pay for the cost of the family planning program, but most likely they will be used to improve the quality of services in the sector in which the savings originate. For example, let us assume a government is committed to maintaining certain classroom-student and teacher-student ratios. With smaller incoming classes of schoolchildren as a result of family planning programs, resources that otherwise would have to be spent just to maintain the ratios and keep the quality of education at the same level, can be used instead to improve quality.

The basic policy issue involved here is the optimal allocation of resources among the social service sectors. It poses two questions. The first is whether a family planning program is financially viable and sustainable. Since either to continue or to expand an existing program would require substantial financial commitment from the government, policymakers and financial planners would definitely want to know how much the program would cost and how much it would save.

The second question is what impact family planning program expenditures would have on the quality of services in the relevant social service sectors. Since those social service sectors are the most likely competitors for a given amount of resources, administrators and planners in those sectors would naturally like to know the short-run and long-run benefits to their respective sectors from investment in family planning programs.

The time span chosen for a financial benefit-cost analysis of family planning programs is very important. The same data will generate different savings results on a per sector basis depending on the time span. A projection with a 5- to 10-year time span will reflect mainly returns from those sectors that benefit immediately from a reduction in births, such as health and food subsidy programs. In order to capture other benefits that may take longer to materialize, such as savings in educational expenditures in high school, and to present all the impacts of family planning programs, the time span should be lengthened to at least 20 years. In fact, analyses should be prepared with both shorter and longer projection spans, to show the magnitudes of both types of benefits.

A public family planning benefit-cost analysis usually includes the following four components:

- an impact component that estimates and projects the impact of a family planning program on total or age-specific fertility rates;

- a demographic component that makes alternative population projections under different fertility scenarios;

- a sectoral component that estimates and projects resource requirements of various social services (e.g., education, health) under different population projections; and

- a benefit-cost component that compares the monetary costs of the family planning program to the monetary benefits in terms of reduced levels of social services required at lower levels of fertility.

Two important points regarding the interpretation of a financial benefit-cost analysis of family planning are worth emphasizing. First, such an analysis addresses only the financial implications of family planning programs and therefore should never be used by itself for formulating population policy. Secondly, measuring benefits in terms of "savings" does not imply that the government would spend less on social services. Rather, it suggests that a family planning program would alleviate the burden of providing the same services to an ever-increasing clientele and would give the government an opportunity to improve the quality of services.

III. Steps in Making BenCost Projections

There are seven key steps in making most projections within BenCost. The steps fall into three areas:

- Preparing two population projections
- Determining health, education, and social service costs
- Making a projection and studying outputs.

The amount of time spent on each area may vary, depending on the application, but most projection activities will include at least the following steps.

A. Prepare a Population Projection

- **Prepare a demographic projection.** BenCost requires a population projection prepared with DemProj. This projection should be prepared first or at the same time as the BenCost projection. The first year and final year of the DemProj projection will determine the span of the BenCost projection. This projection will serve as the common basis for the two family planning projections that BenCost requires. The DemProj manual contains instructions on the steps required to prepare a population projection.
- **Prepare two family planning projections.** BenCost requires that two family planning projections be prepared with FamPlan. These projections should be prepared first or at the same time as the BenCost projection. These projections must be based upon a common demographic projection prepared with DemProj. One will serve as a baseline against which changes in the population over time resulting from changes in the level of intensity of family planning programs are measured. The FamPlan manual contains

instructions on the steps required to prepare a family planning projection. (Appendix A at the end of this manual also gives instructions on creating the baseline projections necessary for BenCost.)

B. Determine Health, Education, and Social Service Costs

- **Collect data.** At a minimum, the following types of base-year data need to be collected: (1) the capital and recurring cost for the health, social services, and education levels in your projection, (2) the applicable age groups and coverage ratios for the health, social services, and education levels you select, and (3) the gender and age mix of household headship within the population over time. Since the projection will only be as good as the data on which it is based, it is worth the effort to collect and prepare appropriate and high-quality data before starting the projection.

  Possible sources for this data are national government cost figures, national statistical yearbooks, service and expenditure reports from different ministries, census reports and population surveys, the United Nations and its affiliated organizations, and USAID.

- **Make assumptions.** BenCost projections require assumptions about the future levels of the participation rates and costs for health, social, and educational services offered within the model. These assumptions should be carefully considered and based on reasonable selection guidelines.

- **Enter data**. Once the base-year data are collected and decisions made about projection assumptions, BenCost can be used to enter the data and make a projection.

C. Make Projection and Study Outputs

- **Examine projections.** Once the projection is made, it is important to examine it carefully. This includes consideration of the various BenCost indicators produced. Careful examination of these indicators can act as a check to ensure that the base data and assumptions were understood and entered correctly into the computer program. This careful examination is also

required to ensure that the consequences of the assumptions are fully understood.

- **Make alternative projections.** Many applications require alternative projections. Once the base projection has been made, the program can be used to quickly generate alternative projections as the result of varying one or several of the model assumptions.

IV. Using the BenCost Model

The BenCost model is a simple medium for users to observe and investigate the interaction between (1) the effects of family planning programs of various intensities and (2) the required levels of service provisioning and expenditures in various social sectors. The current section describes some fundamental features of the model and describes in detail the model's parameter options.

A. Base Year/Target Year Approach

One of the most fundamental features of any projection model is the manner in which users provide input into the model—i.e., how users alter the model's parameters—and how that input affects the evolution of key output variables. The Spectrum BenCost model uses a base year/target year approach to modeling parameter change. As a general feature of any projection model, the base year can be thought of in several ways. In a projection model based on actual social sector data from a given country or set of countries, the base year typically is the most recent year for which all necessary sectoral data are available. For a projection model that deals with population issues or one that is based on population projections, the base year typically is the first year of the model's population projections. These definitions are not mutually exclusive and will frequently coincide. The target year is the final year for which the model carries out parameter changes specified by the user. Equivalently, one can think of the target year as the year in which all parameters reach their target values. The numerical difference between the base year and the target year—which we term the interpolation period—is the number of years over which parameter changes occur.

Within the Spectrum BenCost model, the user has the option of specifying multiple target years. Specifically, for each

public service addressed within the model (referred to as "service options"), a separate target year option is provided. This multiplicity of target years allows the user, for example, to establish a pace of change in primary education that is different from the pace of change in the provision of sewerage services to households. In addition, the user can enter parameter values for each year within the interpolation period. This allows the user to vary the rate of change for each service option within the timeframe of the projection. The entry of large amounts of parameter data is simplified by the use of the "Duplicate" and "Interpolate" functions build into the Spectrum program. For more information on the use of these functions, please see Section VI D 1, "About the Editors," in this manual.

B. Service Options and Service Names

BenCost gives the user great flexibility in defining the health and social sector indicators, also known as "service options," that will be affected by a change in the population growth rate. BenCost divides service options into broad categories. These categories are summarized in the following sections. Within these broad categories, the user is able to specify up to four specific services called Service Names. Each service name can have unique cost and coverage parameters. This flexibility allows an analyst to easily customize the projection to fit the most relevant data at hand. This is discussed in more detail in Section VI D 4, "Entering Data into the Service Options," in this manual.

C. Parameter Options

The procedures for editing all service options are covered in the tutorial section within this manual.

As described above, the user affects the evolution of the model's variables by altering the values of a set of parameter options over the course of the model's timeframe. The Options page is designed to be a fairly simple area where parameter values can be viewed and edited. In addition, the user has the ability to set lower and upper age limits for service eligibility, the discount rate, capital and recurrent costs, and names of services. The procedures for performing these tasks are covered in the tutorial section within this manual. It is worth taking a moment to discuss the meaning of these terms as they are used in BenCost.

1. General Terms and Examples

Within each of the service sector options, the user has the ability to set the recurrent cost per participant and the capital cost per participant.

The recurrent cost feature can be used to capture the cost of items that will accrue for every new participant. In the case of an immunization program set up by the user under the child health option, this feature could be used to show the cost of a clean needle, a dose of vaccine, and the cost of a clinician's time required to administer the vaccine. In the case of the education option, the recurrent cost feature could be used to capture the cost of school uniforms, new teachers, and educational supplies.

In contrast, the capital cost feature allows the user to capture the cost of longer-term investments. Capital cost items are often amortized over a period of several years. For example, under the child health option, the capital cost feature could be used to capture the cost of a series of new rural health clinics. If each clinic could serve 5,000 children per year, and each clinic cost $7,000 per year in property rent, depreciation, power, and general operating expenses, the capital cost per child would be $1.40 per year. If $1.40 per each new child per year were entered into the model, the implied assumption would be that for every 5,000 children, a new clinic would be built.

2. Education Sector Options

Within the model's education sector options, the user has the ability to specify the number of levels in the education system. This type of flexibility permits, for example, breaking an education system down into "primary" and "secondary" components, or, at a slightly higher level of disaggregation, investigating the "lower primary," "upper primary," "junior secondary," and "senior secondary" components. Other divisions are possible. The model also allows the education sector to be excluded from consideration in the analysis.

For each level, the user specifies a level name, the lower and upper age limits for attendance within that level, and the enrollment rate. Given that the population projections run from age 0 through age 75+, the user must limit selections to this range. The user should avoid a lower limit greater than the upper limit. Setting the lower limit equal to

the upper limit effectively defines a single-year (age) level. Overlapping age ranges will result in double-counting of students and will give an upward bias to enrollment and expenditure measures.

Once the level is named, enrollment rates are set, and appropriate age limits defined, the user sets the level of recurrent cost per student, and capital cost per new student for each year within the projection period. The enrollment rate is used to determine the number of students within each level as a percentage of the age group defined by the user. The levels of recurrent and capital cost can assume any nonnegative values. In generating recurrent and capital expenditure figures, the model applies the recurrent cost per student to the number of students within the level for a given year, and applies the capital cost per new student to the number of new students within the level, defined as current enrollment less the previous year's enrollment.

3. Maternal Health Services Options

Maternal health services options represent the first of three health-related service options within the model. Within the maternal health area of the model, the user can specify up to four service options. For each option, the user can specify a name, coverage rates per year, level of recurrent service cost per year, and level of capital cost per year. The coverage rate is applied to the total number of pregnancies calculated in FamPlan. Coverage rates can assume any nonnegative value less than or equal to 100 percent.

4. Child Health Services Options

Within the child health area of the model, the user can specify up to four service options. For each option, the user can specify a service name, upper and lower age ranges, coverage rates per year, level of recurrent service cost per year, and level of capital cost per year.

5. Other Health Services Options

The other health services area of the model is provided to allow the user to capture the cost of additional health programs that affect the general population. Within this area the user can specify up to four service options. For each option, the user can specify a service name, upper

and lower age ranges, coverage rates per year, level of recurrent service cost per year, and level of capital cost per year.

6. Other Social Services Options

The other social services area of the model is provided to allow the user to capture the cost of additional social programs that affect the general population. Within this area the user can specify up to four service options. For each option, the user can specify a service name, upper and lower age ranges, coverage rates per year, level of recurrent service cost per year, and level of capital cost per year.

7. General Household Services Options

The general household services area of the model allows the user to capture the cost of additional programs that are offered at the household rather than the individual level. Within this area the user can specify up to four service options. For each option, the user can specify a service name, household coverage rates per year, level of recurrent service cost per year, and level of capital cost per year.

8. Household Headship Parameters

The final set of parameter options provided to the user is a set of gender-specific household headship rates. The user has the option of selecting both male and female household headship rates for each year of the projection. A household headship rate specifies the percentage of individuals from a given population subgroup who are household heads. Specifying a household headship rate of 23 percent for 15- to 19-year-old females, for example, would mean that 23 percent of all females between the ages of 15 and 19 (inclusive) were heads of a household. The product of this percentage and the number of individuals within the subgroup would yield a number of households. The sum of all households headed by individuals from different, nonoverlapping population subgroups would be the total number of households.

V. Projection Outputs

BenCost will calculate and display the costs and benefits that will be incurred over time under two different scenarios: one with all unmet family planning need met at some point within the model timeframe, and one with family planning needs remaining unmet. BenCost will illustrate the savings that can be realized by meeting the family planning need of the population over time.

BenCost will calculate and display social-sector cost indicators by year. The model is flexible and allows the user to define multiple categories for most services; for example, under education, the user may view results for both primary and secondary schools. A complete list of indicators available is given below.

- **Education.** For each tier of the education system established by the user, the following indicators are generated:
  - Potential students (determined by population within the given age group)
  - Number of students (determined by the enrollment rate)
  - Recurrent student expenditure
  - Capital student expenditure
  - Total student expenditure
- **Maternal health.** For each maternal health service established by the user, the following indicators are generated:
  - Pregnancies covered
  - Recurrent pregnancy expense
  - Capital pregnancy expense
  - Total pregnancy expense

- **Child health.** For each child health service established by the user, the following indicators are generated:
  - Children covered
  - Recurrent child expenditure
  - Capital child expenditure
  - Total child expenditure
- **Other health.** For each other health service established by the user, the following indicators are generated:
  - Individuals covered
  - Recurrent individual expenditure
  - Capital individual expenditure
  - Total individual expenditure
- **Other social.** For other social services established by the user, the following indicators are generated:
  - Individuals covered
  - Recurrent individual expenditure
  - Capital individual expenditure
  - Total individual expenditure
- **General household.** For each general household service established by the user, the following indicators are generated:
  - Households covered
  - Recurrent household expenditure
  - Capital household expenditure
  - Total household expenditure
- **Costs and benefits.**
  - FamPlan Costs—Displays the total cost of family planning programs established using the FamPlan model for both family planning need scenarios.

- Social Expenditure—Displays the aggregated total cost of all social service expenditures under both scenarios.
- Marginal FamPlan Costs—Displays the difference in family planning costs between the two family planning scenarios.
- Social Sector Savings—Displays the difference between the cost of all social sector programs under both family planning need scenarios.
- Benefit Cost—Displays two indicators: (1) the benefit-cost ratio, or the ratio of the sum of the discounted service provision savings (benefits) to the sum of the discounted marginal cost of meeting all family planning needs; and (2) the internal rate of return (IRR), a value that equates the sum of the stream of discounted costs to the sum of the stream of discounted benefits and provides a quick reference number to measure the value of the additional family planning investment.

VI. Program Tutorial

This tutorial covers the key steps in installing and running Spectrum and BenCost. It assumes that you have an IBM-compatible computer running Windows 3.1, Windows 95, or Windows 98 and that you are familiar with the basic operation of Windows programs and terminology.

A. Before You Get Started

First, you will need to run DemProj and FamPlan, part of the Spectrum system of policy models; please refer to their manuals for more information. Note that you will need to run the models to create two separate projections, one with a goal of meeting unmet need and one with a constant contraceptive prevalence rate. Then, you will need to collect data and make certain decisions before running BenCost. For example, you will need to decide the following at the very beginning:

- The initial and final years of the population projection (set in DemProj).
- The currency that will be used to measure costs (also set in DemProj).
- The number of levels in the education system (e.g., primary and secondary or lower and upper primary and junior and senior secondary).
- The service options for maternal health care, if relevant to your projection, such as programs for prenatal screening or vitamin supplements.
- The types of health and service options for child health care such as immunizations, food supplements, etc.
- Other health services options, such as general health coverage.

- The cost and prevalence of social services options, such as social safety net programs, transportation programs, or public safety programs.
- The cost and prevalence of services offered at the household level, such as sewerage and garbage collection.

The data you will need include:

- A population projection completed in DemProj.
- A family planning projection based on that population using FamPlan. Note: two projections must be run using the same data—one with goal of meeting unmet contraceptive need, and one with a constant unmet contraceptive need. (See also Appendix A.)
- The capital and recurring cost for the health and social services in your projection.
- The applicable age groups and coverage ratios for the health and social services you select.
- The gender and age mix of household headship within the population over time.

These inputs are all described in Section IV of this manual.

B. Installing the Spectrum Program

The Spectrum program is distributed on floppy diskettes; it is also available through the Internet at http://www.tfgi.com/software/software.htm or http://www.policyproject.com. However, it must be installed onto a hard disk before it can be used. Spectrum will run on any IBM-compatible computer running Windows 3.1, Windows 95, or Windows 98. It requires about 3MB of hard disk space.
To install the Spectrum program, start by inserting the "Install" diskette into your floppy disk drive.[3]

For Windows 3.1: Select "File" from the Program Manager menu, then select "Run". In the dialogue box that appears, type the file name "a:\setup.exe" and press "Ok". (If the install disk is in floppy disk drive b, then use the file name

[3] To remove the Spectrum program from your hard disk, run the Unwise program located in the Spectrum directory.

"b:\setup.exe"). Follow the instructions on the screen to complete the installation.

For Windows 95 or 98: Select "Start" from the task bar. Then select "Run" from the pop-up menu. In the dialogue box that appears, type the file name "a:\setup.exe" and press "Ok". (If the install disk is in floppy disk drive b, then use the file name "b:\setup.exe"). Follow the instructions on the screen to complete the installation.

C. Creating a New BenCost Projection

1. Starting the Spectrum Program

To start Spectrum, use one of the following methods:[4]

In Windows 3.1:

1. Double-click on the Spectrum icon on the desktop, or
2. Use the File Manager to locate the directory "c:\spectrum\" and then double click on the file named "spectrum.exe".

In Windows 95 or 98:

1. Click the "Start" button on the task bar.
2. Select "Programs" from the pop-up menu.
3. Select "Spectrum" from the program menu. Alternatively, you can use Windows Explorer to locate the directory "c:\spectrum" and double click on the file named "spectrum.exe".

2. Viewing Spectrum in Another Language

To change the language of the Spectrum models from English to French, Arabic, Spanish, or Russian,

1. Select "Options" from the menu bar.
2. When the submenu appears, select "Environment".
3. Select the language in which you wish to view the Spectrum models.

[4] The computer screen prototypes in this manual correspond to Windows 95.

4. Click on “Ok”.

3. Opening the First Demographic Projection--The Baseline

The first step in preparing the BenCost projection is to open an existing demographic projection that has a constant level of unmet family planning need throughout the model’s timeframe.

1. Select “File” from the menu bar.

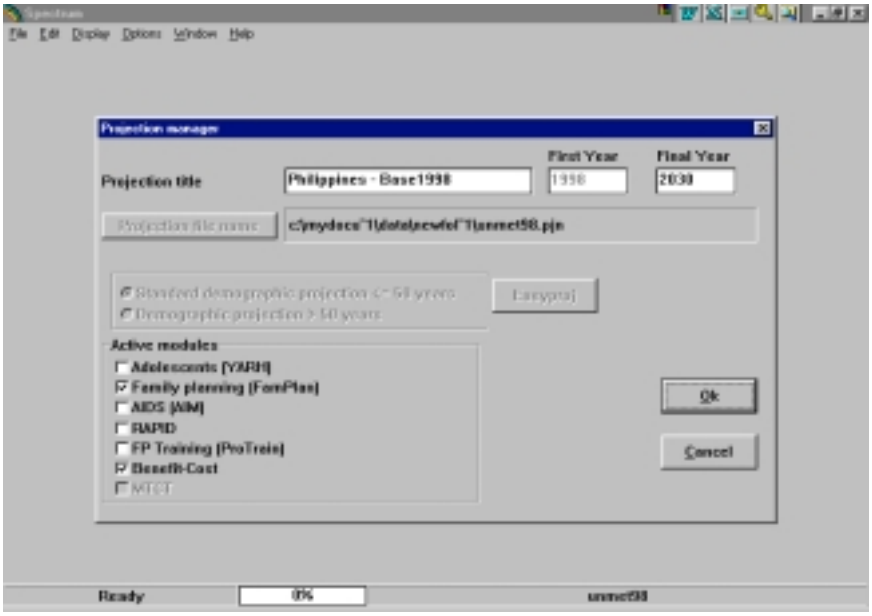
2. From the pull-down menu that appears, select “Open projection”.

3. Select the projection file from the “Open” dialogue box and press “Ok”. All pre-existing projections that can be loaded will be listed here.

4. Adding the BenCost Module to the Projection

Once the demographic projection is open, you need to change the configuration to indicate that the BenCost module will be used as well. To do this, select “Edit” from the menu bar and “Projection” from the pull-down menu. You will see the Projection Manager dialogue box. It will look something like the display shown below.

If a box is shown in gray, you will not be able to change its contents. It means that a projection has been loaded, and the data must remain the same. If you want to create an entirely new projection, you should close the other projections, using “File” and “Close,” and then select “File” and “New”.



Once all the information is entered for this dialogue box, click on the "Ok" button. You can always return to this screen and change some of the information by selecting "Edit" from the menu bar and then "Projection" from the pull-down menu.

Active modules. These radio buttons (or options) let you select other modules that will be used with the population projection. The family planning (FamPlan) box should be checked. You should select the "BenCost" module by clicking on the check box next to the name. This choice will allow you to include the BenCost module in the projection.

The following information is displayed.

Projection title: This title will be printed at the top of all printed output and will be used to identify the projection if more than one projection is loaded at a time. You can change the title to reflect the projection you are about to prepare.

If you want to change the projection file name, the years, or the demographic projection interval, you will need to do so in DemProj. The options in the Projection manager were set when the demographic projection was created with DemProj.

Projection file name: This is the name that will be used to store all data files associated with this projection. You cannot change the file name here. You can change it if you select "File" and "Save projection as" to save the projection to a new name.

First year: This is the first year of the projection, determined in the DemProj projection.

Final year: This is the final year of the projection, determined in the DemProj projection.

Demography. The radio button labeled "Standard demographic projection <= 50 years" will be selected by default. You cannot change this selection here because the demography module is required to make a family planning projection.

Once all the information is entered for this dialogue box, click on the "Ok" button. You can always return to this screen and change some of the information by selecting "Edit" from the menu bar and "Projection" from the pull-down menu.

5. Opening the Second Projection

For step-by-step instructions on how to create a second projection with a constant level of unmet contraceptive need, please see Appendix A at the end of this manual.

Repeat the steps above to open the second demographic projection. This projection should be based on the same demographic population as the first projection. However, the family planning scenarios in the two projections may be different. For step-by-step instructions on how to create a second projection with a different level of unmet contraceptive need, please consult the FamPlan manual or see Appendix A at the end of this manual. Note: For the second projection to open properly, the same modules must be active in it as are active in the baseline projection. Generally, the second projection shows unmet Family Planning need being met at some point during the model's timeframe.

D. Entering the Projection Assumptions

1. About the Editors

Data entry for BenCost is similar to that for other Spectrum modules. Projection assumptions are added by using the editor function. Editors are similar in appearance to a spreadsheet or table. The names of the variables appear in rows to the left of the editor. Each year of the projection is listed in a separate column at the top of the editor. To enter data you must first activate the editor. To activate the editor, click inside a cell within the table. A scroll bar will appear once the editor is activated that will allow you to view multiple years.

Each editor in BenCost is similar. At the very top of the screen, the variable name appears. At the bottom of the screen are the special edit keys. "Duplicate" allows you to copy information from one cell, column, or row to another; "Interpolate" to enter a beginning and ending number and have the computer calculate numbers for the intervening intervals; "Multiply" to multiply a cell, column, or row by a specific number; and "Source" to write notes indicating the source of the data for future reference.

To use the "Duplicate" button,

1. Highlight (select) the range (column, row, or cells to be affected). The first cell in the range should be the value you want to copy.

2. Extend the range to the last year by using the mouse (hold down the left button and drag the range) or the keyboard (hold down the shift key and use the arrow keys).

3. Click on the "Duplicate" key to copy the value at the beginning of the range to all the other cells in the range.

To use the "Interpolate" button,

1. Enter the beginning and ending values in the appropriate cells.

2. Highlight the entire range from beginning to end.

3. Click on the "Interpolate" key to have the values interpolated and entered into each of the empty cells.

To use the "Multiply" button,

1. Highlight the range (column, row, or cells to be affected).

2. Enter the multiplier in the dialogue box.

3. Click "Ok" to accept. The entire range will be multiplied by the designated number.

To use the "Source" button,

1. Click on the "Source" button to open a small word processor window.

2. Enter the source of the data and make any special comments about the assumptions.

3. Click on "Close" to return to the editor.

*It is **strongly** recommended that you use the "Source" feature to avoid later confusion.*

This feature allows you to keep a record of the data sources and assumptions as you make the projections. This source information will be maintained with the data file and printed whenever you print the projection summary. It is **strongly** recommended that you use this feature to avoid later confusion.

If you decide that you do not want to keep the changes you have just made, click the "Cancel" button in any editor. This will exit the editors and restore all inputs to their values before you entered the BenCost editor. Any changes made during the editing session will be lost.

When you have finished entering all the necessary data for the component into the editor,

1. Click the "Ok" button to return to the "BenCost data" dialogue box.
2. Click the "Close" button to complete the editing process.
3. The "Cancel" button allows you to exit the editor without making any changes to the data.

2. Specifying the BenCost Projection Parameters

For readers who feel they need additional review or explanations of the terms found in this chapter, Section IV and the glossary of this manual may be useful.

Access to the editors within BenCost is controlled by the BenCost dialogue box. A sample of this dialogue box appears below. To access this dialogue box, select "Edit" from the menu bar and "BenCost" from the pull-down menu. You will be prompted to chose which of your two projections you would like to edit. Once you have selected one, a dialogue box like the one shown below will appear.

If you are creating a new projection, most of the buttons in the box will appear gray. Users creating a new benefit-cost projection have two options at this point: They may

configure service names by clicking the "Configuration" button, or they may establish household headship parameters by clicking the "Headship" button.

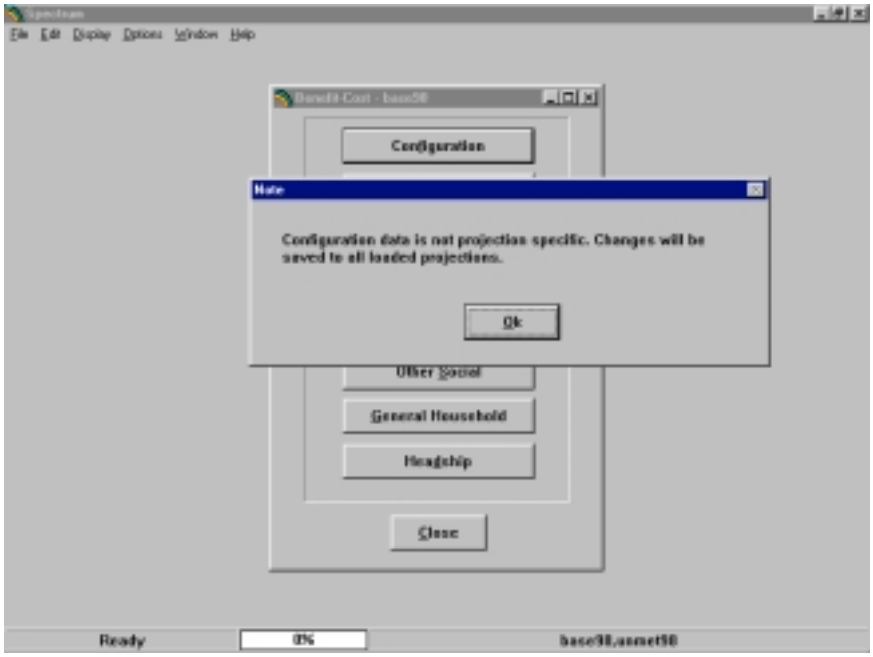
3. Specifying or Altering Service Names and the Discount Rate

To edit service names or the discount rate for a BenCost projection:

1. Choose "Edit" from the menu bar.

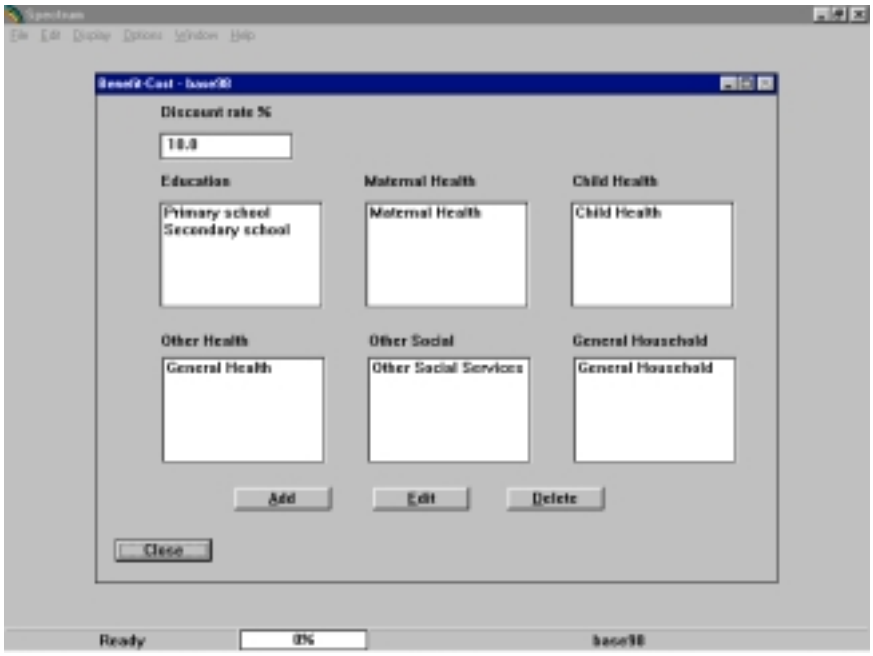
2. Choose "BenCost" from the pull-down menu.

3. Click the "Configuration" button in the BenCost dialogue box. The following picture will be displayed:



4. Click "Ok"[5]. The following screen will be displayed:

[5] An important Note about "Ok": The message that appears when the user clicks the "Ok' button states that "Configuration data is not projection specific. Changes will be saved to all loaded projections". This is true. When the user creates a new service name such as "Primary School", it will be added to both projections. However, when the user is ready to enter or edit the cost and coverage data for this or any other service, the data entry must be duplicated in both projections. Failure to do so will alter the outputs of the projection. While this may be a desired effect, users should be aware of this feature.



From this "Configuration" dialogue box, you can choose the discount rate and the services you want to include in your projection.

Specifying the Discount Rate %

You should assign the expected discount rate for the time period of the projection. To enter the percentage rate, click within the "Discount Rate %" box and enter the percentage rate. To alter the percentage rate, highlight the number that is currently in the box and enter the percentage rate.

For more information on the discount rate, please see Section II, A.

Specifying or Altering the Service Names under Service Options

From the Configuration dialogue box (see previous screen), you may add subcategories to the service options used in the BenCost projections. The service options are categorized as education, maternal health, child health, other health, other social, and general household. Service names are defined by the user. You may add up to four service names under each service option.

To edit service names or the discount rate for a BenCost projection:

1. Choose “Edit” from the menu bar.

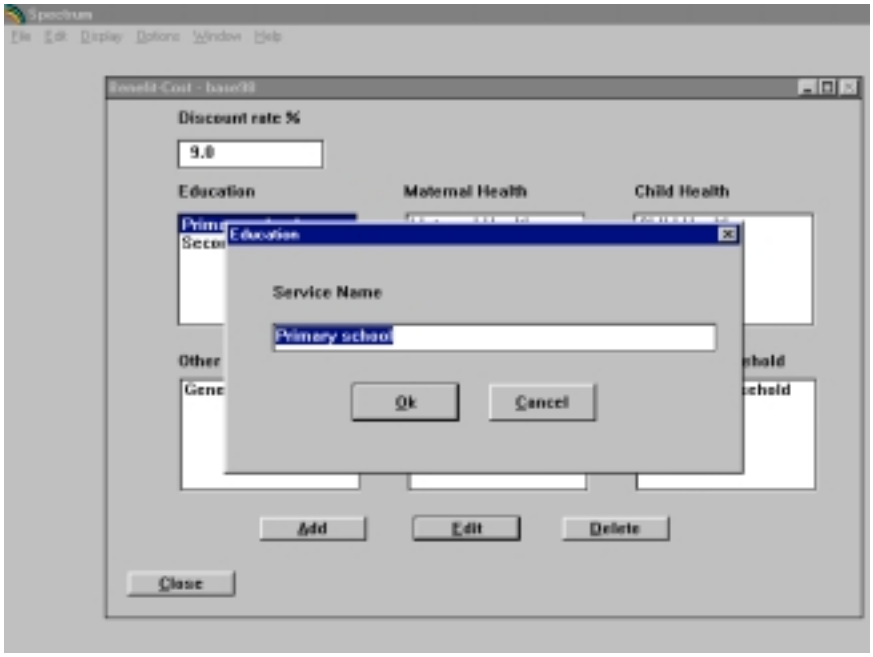
2. Choose “BenCost” from the pull-down menu.

3. Click the “Configuration” button in the BenCost dialogue box.

4. Place the cursor in the service option box for which you wish to create a new service name.

5. Click the “Add” button.

6. Enter the desired name in the pop-up window that appears.



To delete service names, select the desired service name and click the “Delete” button. Note: this action does not delete any data you may have entered in the service name. It simply removes this set of data from the projection. To add the data set back in, follow the Edit Service Name procedure above and enter the name of the service you wish to restore**. Note: The name must be spelled exactly as it was before it was removed or BenCost will not be able to access the data.**

4. Entering Data into the Service Options

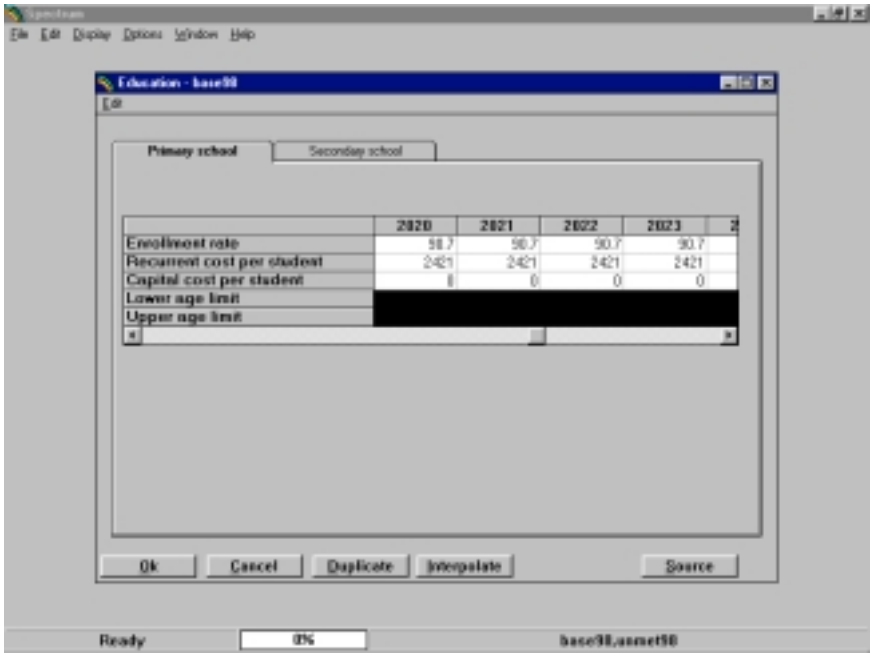
Please note that service option data must be entered into both projections. For example, if you add cost and coverage data to the Primary School service in the first projection, you must save your changes, and enter the same data in the second projection.

Once you have defined service names for the various service options, you may begin entering data into the service options you have defined. Please note that service option data must be entered into both projections. For example, if you add cost and coverage data to the Primary School service in the first projection, you must save your changes, and enter the same data in the second projection.

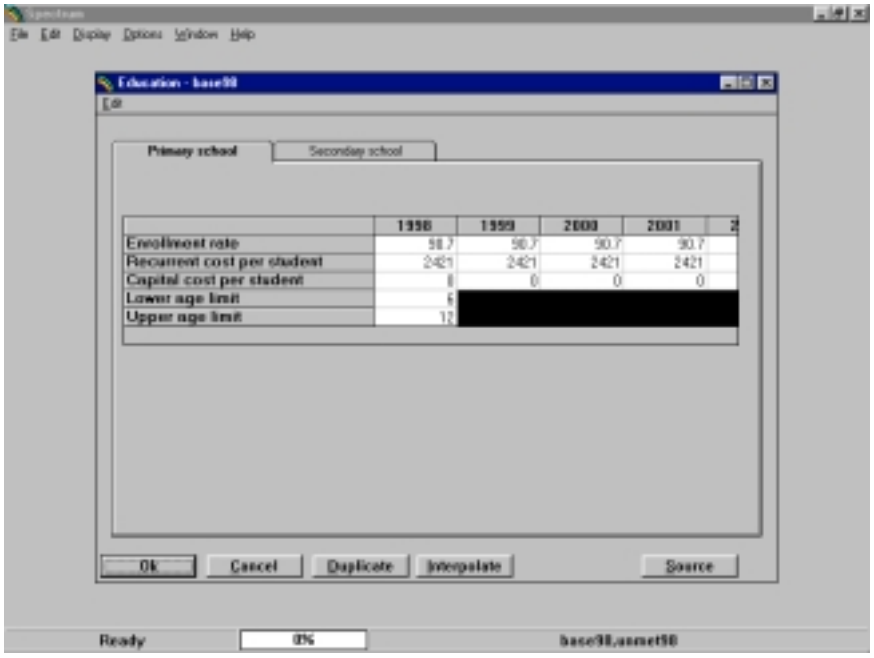
Be sure that any cost data entered into BenCost are in keeping with the terms of the currency parameters defined in DemProj. If you need to confirm the currency settings for the projection you are working with, you may do so by selecting "Edit" from the menu bar, followed by "DemProj" and then "Projection Parameters".

To enter BenCost data, select "Edit" from the menu bar and "BenCost" from the pull-down menu. Chose the projection for which you wish to enter data, then click on the service option button that corresponds to the data you wish to enter.

To enter data into any of the service options, you must first activate the editor. To activate the editor, click inside a cell within the table. You may now use the mouse or the arrow keys on the keyboard to navigate between cells in the editor table. In addition, once you have activated the editor, a scroll bar will appear that allows you to view multiple years. The scroll bar is visible in the following picture.



Education Sector Options



Five types of information are required for each of the four possible service categories under Education.[6] Once you have entered the data for one category, click the next tab to enter data for a subsequent category.

1. **Enrollment rate.** Enter the percentage of this age group that is enrolled in school.

2. **Recurrent cost per student.** Examples of recurrent costs for education might be textbooks or school uniforms.

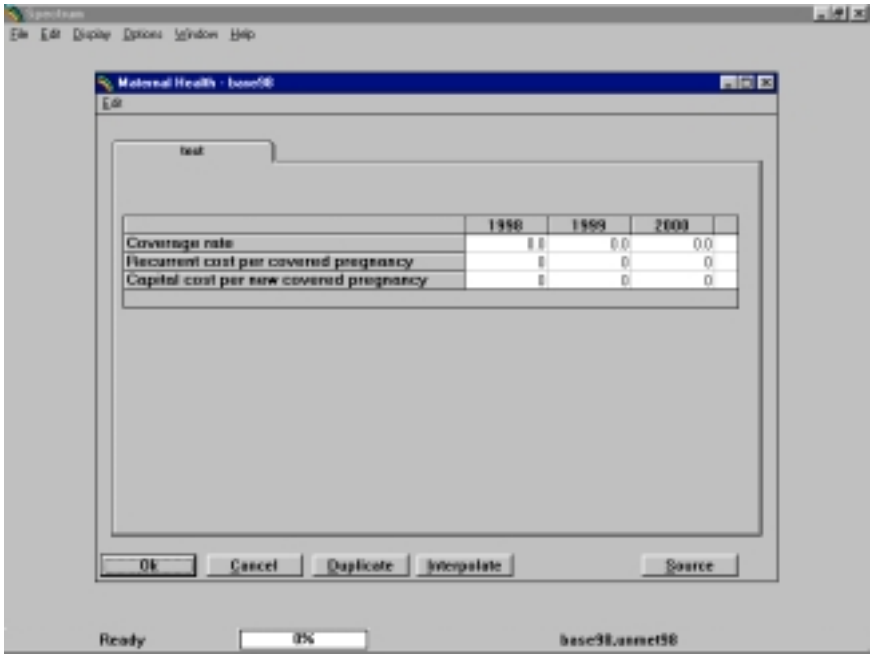
3. **Capital cost per student.** This option can be used to capture the cost of more durable items that will be used for several years, such as the cost of new school construction.

4. **Lower age limit.** Enter the youngest age for this educational category.

5. **Upper age limit.** Enter the oldest age for this educational category.

[6] For each of the service options, users can specify one to four service categories with names of their choosing. The sample applications throughout the tutorial may not necessarily use all possible categories. Service categories appear as separate tabs on the BenCost screens.

Maternal Health Service Options



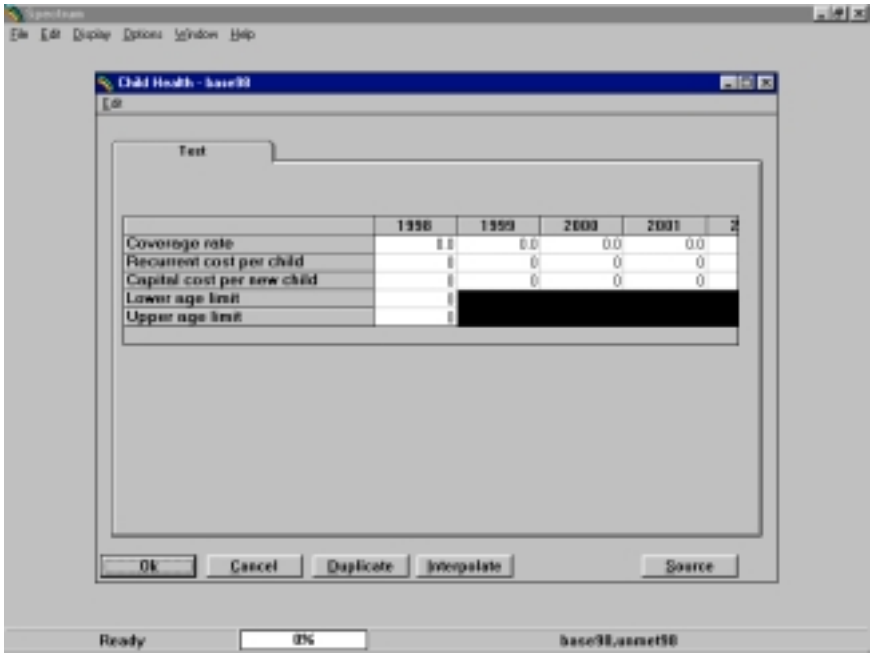
Three types of information are required for the four possible service categories under Maternal Health.

1. **Coverage rate.** Enter the percentage of pregnancies covered by this service.

2. **Recurrent cost per covered pregnancy.** These recurrent costs might include antenatal screening, vitamins, or food supplements.

3. **Capital cost per new covered pregnancy.** Capital costs in this category could be for a new maternal health clinic, for example, or other investments that will provide benefits for a number of years.

Child Health Service Options



Five types of information are required for the four possible service categories under Child Health.

1. **Coverage rate**. Enter the percentage of children in this age group covered by this service.

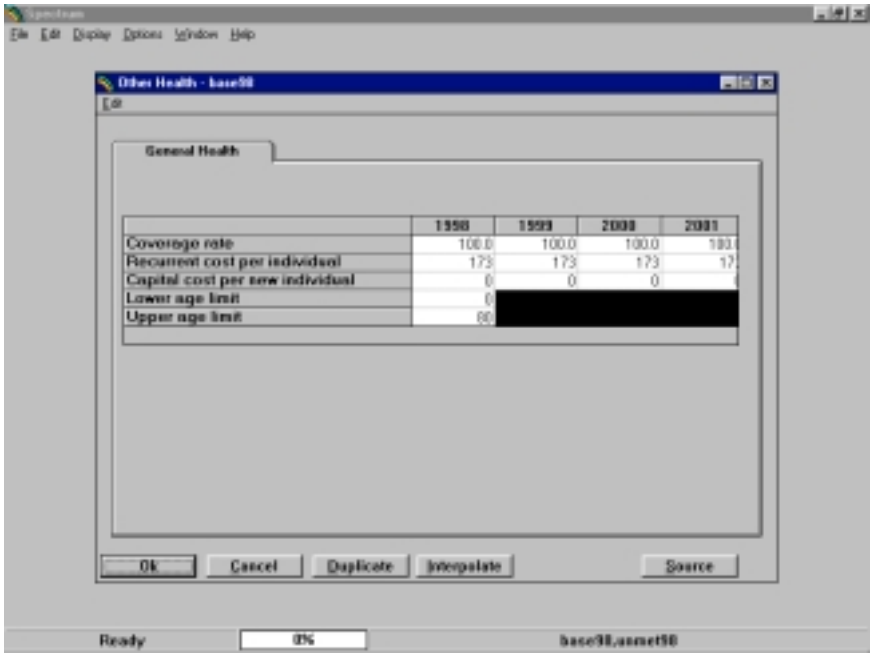
2. **Recurrent cost per child.** Examples of recurrent costs per child might be immunizations or food supplements.

3. **Capital cost per new child.** Per-child costs for a new pediatric clinic could be included in this category.

4. **Lower age limit.** Enter the youngest age for this child health service category.

5. **Upper age limit.** Enter the oldest age for this child health service category.

Other Health Service Options



Five types of information are required under Other Health, which offers four possible service categories.

1. **Coverage rate.** Enter the percentage of individuals in this age group who are covered by this service.

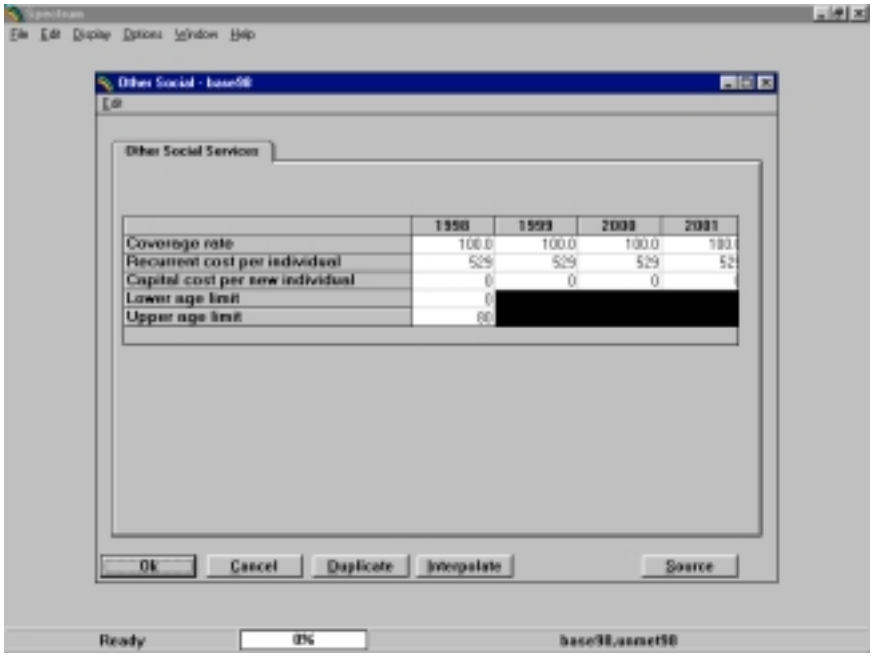
2. **Recurrent cost per individual.** This line can be used to capture recurrent health costs that were not incorporated into the maternal health or child health expenditure categories. Expenditures involved are those that would affect the general population.

3. **Capital cost per new individual.** An example could be per-individual costs for a new hospital.

4. **Lower age limit.** Enter the youngest age.

5. **Upper age limit.** Enter the oldest age.

Other Social Service Options



Five types of information are required for each of the four possible service categories under Other Social Services.

1. **Coverage rate.** Enter the percentage of individuals in this age group who are covered by this service.

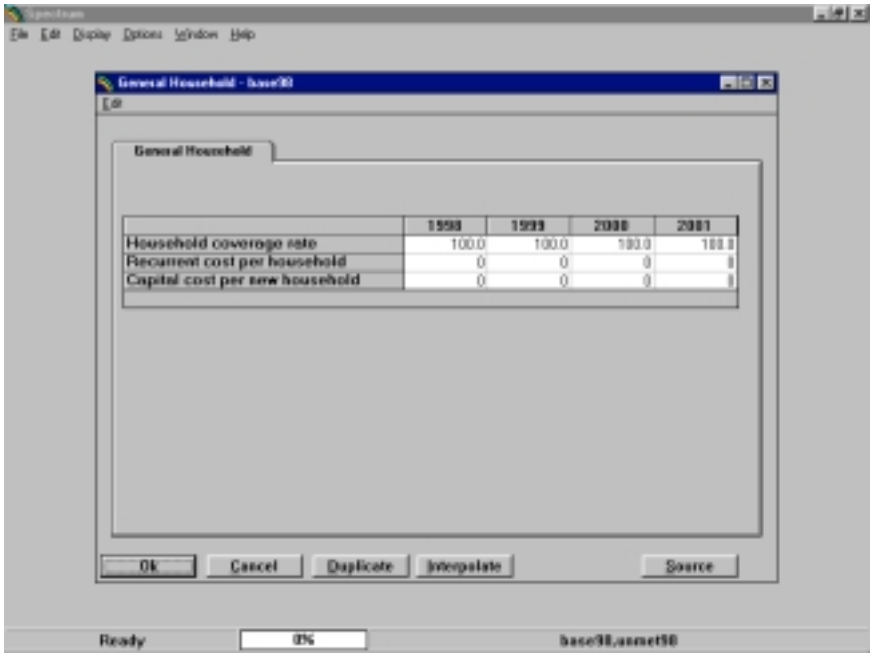
2. **Recurrent cost per individual.** This entry might include the costs per covered individual of a literacy campaign.

3. **Capital cost per new individual.** An example might be per-individual costs for constructing and stocking a new library.

4. **Lower age limit.** Enter the youngest age.

5. **Upper age limit.** Enter the oldest age.

General Household Service Options



Three types of information are required for each of the four possible service categories under General Household Services.

1. **Household coverage rate.** Enter the percentage of households covered by this service.

2. **Recurrent cost per household.** This can be used to capture the recurring costs of programs that affect the population at the household level, such as the annual cost of running water and sanitation services.

3. **Capital cost per new household.** This could be used to reflect the cost of installing new infrastructure that provides benefits at the household level – such as a new water system.

5. Editing Household Headship Parameters

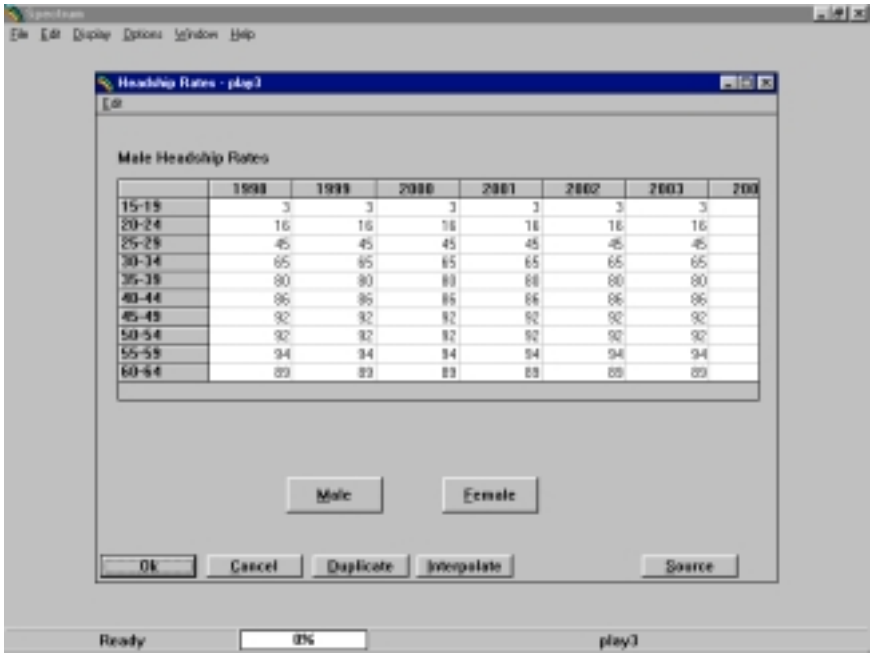
The household headship rate specifies the percentage of individuals from a given population subgroup who are household heads. Specifying a household headship rate of 23 for 15- to 19-year-old females, for example, would mean that 23 percent of all females between the ages of 15 and 19 (inclusive) were heads of a household. Values must be between 0 and 100 and should be entered without the percent sign.

To edit household headship parameters in a BenCost projection:

1. Choose “Edit” from the menu bar.

2. Choose “BenCost” from the pull-down menu.

3. Click the “Headship” button in the BenCost dialogue box. The following screen will be displayed:



You can enter both male and female data by clicking the respective “Male” and “Female” buttons on this screen.

6. Leaving the BenCost Data Editors

Once you have entered all the necessary information,

If you decide that you do not want to keep the changes you have just made, click the "Cancel" button in any service option editor. This will exit the editor and restore all inputs to their values before you entered the editor. Any changes made during the editing session will be lost.

1. Leave the BenCost editor by clicking the "Ok" button in any of the editors. When you click the "Ok" button, the program will record your changes and return to the "BenCost data" dialogue box.

2. Click the "Close" button to keep your work, and you will return to the main program.

7. Saving the Input Data

Once you have entered the projection assumptions, it is a good idea to save the data onto your hard disk. To do this, select "File" from the menu bar and "Save projection" from the pull-down menu. The data will be saved using the file name you specified earlier.

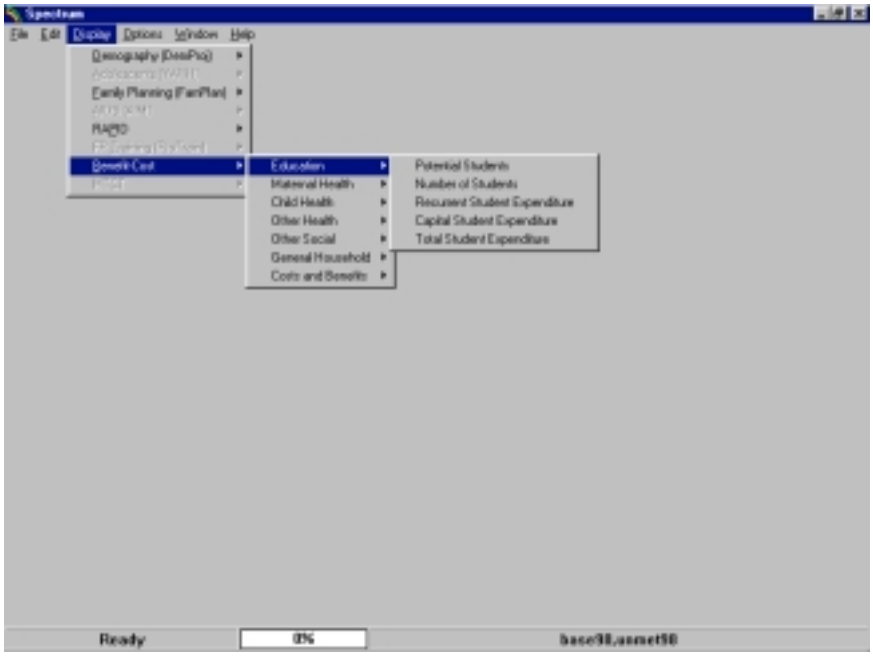
E. Making the Projection

Whenever you enter data for a new projection or edit the assumptions, BenCost will note that the data have been changed. The next time you try to display an indicator it will inform you that the data may have changed and ask if you want to recalculate the projection. Normally, you should answer "Yes" to this question. BenCost will then make the projection. This may take only a few seconds if you are making only a population and family planning projection, or could take somewhat longer if you are also making a projection including AIDS or the RAPID module (see *DemProj: A Computer Program for Making Population Projections;* and *RAPID: Computer Programs for Examining the Socioeconomic Impacts of Population Growth*). Once the projection is made you will not be asked if you want to do the projection again unless you edit the assumptions.

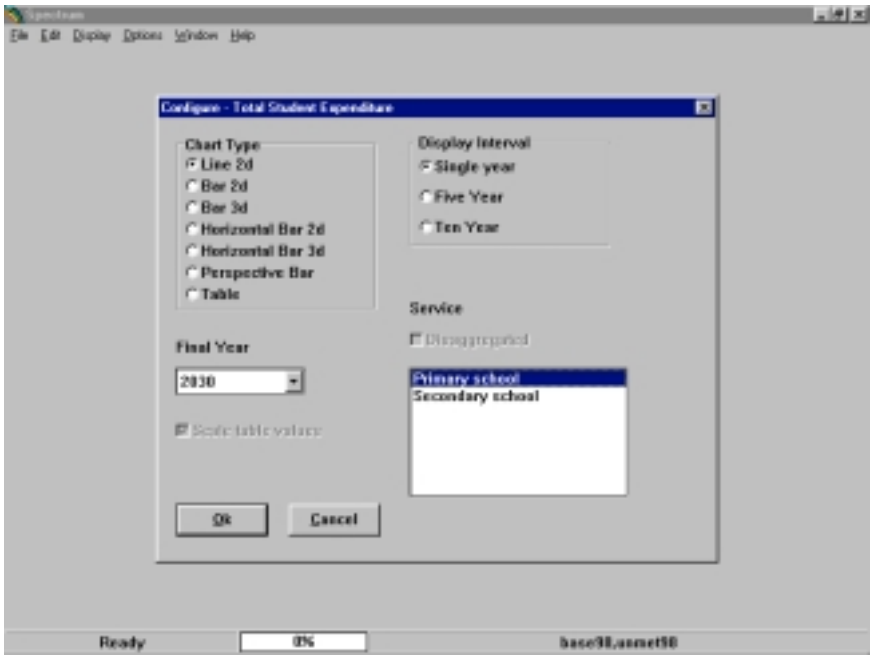
F. Examining the Output

To see the results of the projection, select “Display” from the menu bar. From the pull-down menu select “BenCost”. You will then see another menu showing the indicators available:

- Education
- Maternal Health
- Child Health
- Other Health
- Other Social
- General Household
- Costs and Benefits



Choose one of these indicators. Then you will see the "Display" dialogue box. It will look something like the one shown below.



To select several service names at once, hold down the Ctrl key while clicking on each category.

The exact choices available will depend on the indicator you have selected. From most indicators, you will have the option to choose which service names will be represented in your chart or table. In the example above, the chart could represent either Primary school expenditures, Secondary School expenditures, or both.

To select several service names at once, hold down the Ctrl key while clicking on each category. Each service name will remain highlighted to indicate that they are included. When you see the display, the numbers will refer to just those service names selected.

The display interval will normally be in single years, but you can change it to display in 5- or 10-year increments if desired. Normally the display will show all years in a projection. However, if you want to see only part of the projection, you can change the final year by selecting a new final display year from the "Final year" list box.

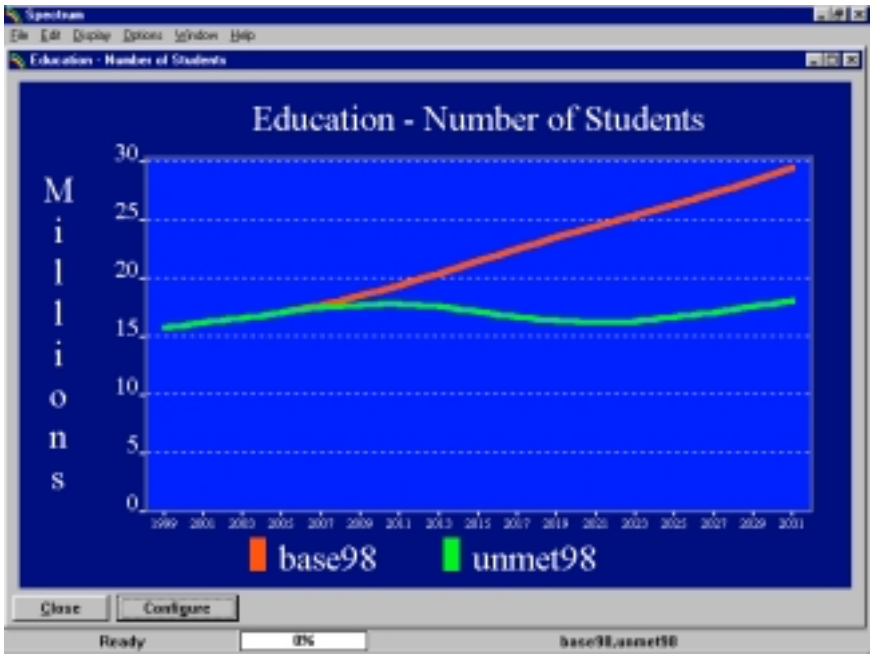
Once you are satisfied with the display parameters, click the "Ok" button to display the results. Outputs will either be expressed as a table or a chart, depending upon which option you have selected.

1. Graphs and Bar Charts

BenCost will display a variety of graphs and bar charts, including:

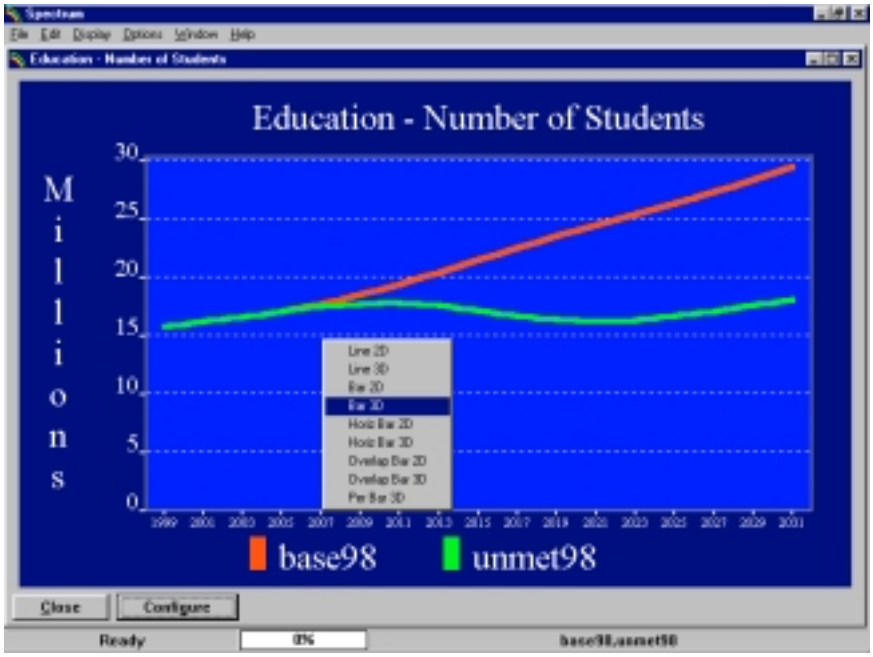
- Line charts
- Two- and three-dimensional bar charts (column charts)
- Two- and three-dimensional horizontal bar charts
- Two- and three-dimensional overlap bar charts (bars for multiple projections are shown on top of each other)
- Three-dimensional perspective bar charts.

Here is an example of a two-dimensional line chart illustrating the number of students given the assumptions made in the two projections.



Note that all projections that are currently in use will be displayed on the same graph.

You can change the chart type, display interval, and final year to be displayed by clicking the "Configure" button. You can also change the chart type by putting the mouse pointer anywhere inside the chart and clicking with the right mouse button (example below).



To print the current (selected) chart, select “File” from the menu bar and “Print” from the pull-down menu.

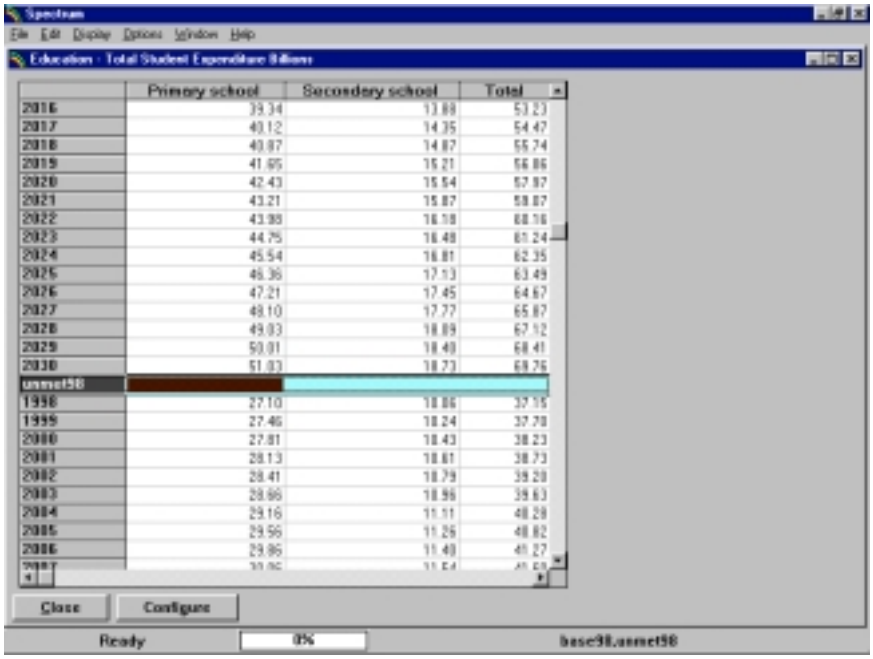
To close the display, click on the “Close” button. You do not have to close the display immediately. You can choose to display another indicator, and it will appear on top of the first display. The first display will be covered but will still be there. You can return to any previous display that you have not closed by choosing “Window” from the menu bar and selecting the name of the display from the pull-down menu. From the “Window” selection you can also choose to tile or cascade all the existing display windows.

2. Tables

BenCost will also display data in the form of tables. In tables, each projection that is in use will be displayed in a separate column. You can scroll through the table to see all the years by using the PgUp and PgDn keys or by using the mouse.

When the “Chart Type” is set to “Table,” you may see a check box labeled “Disaggregated” above the service list. Checking this box will allow you to display all the service names individually. For example, if you check the “Disaggregated” box when setting the display options for education in the example above, you will see a table showing each service name (in this case Primary Education and Secondary Education) in a separate column with a

total column on the right. The columns will be split in half horizontally with the top half showing the values for one data set and the bottom half showing the values for the second data set. Click within the table to activate the scroll bar if you need to see the bottom set of data. (See example below.)



To print a table, select "File" from the menu bar and "Print" from the pull-down menu.

To export data into Microsoft Excel or other spreadsheet program, select "copy all" from the edit menu.

To export data into Microsoft Excel or other spreadsheet program, select "copy all" from the edit menu. You may export smaller selections of data by highlighting the cells you wish to export and selecting "copy" from the edit menu. Follow the instructions of your spreadsheet application to paste the data into the appropriate sheet.

3. BenCost Calculation

BenCost will also display the benefit-to-cost ratio and internal rate of return for a comparison of two projections.

To display this indicator:

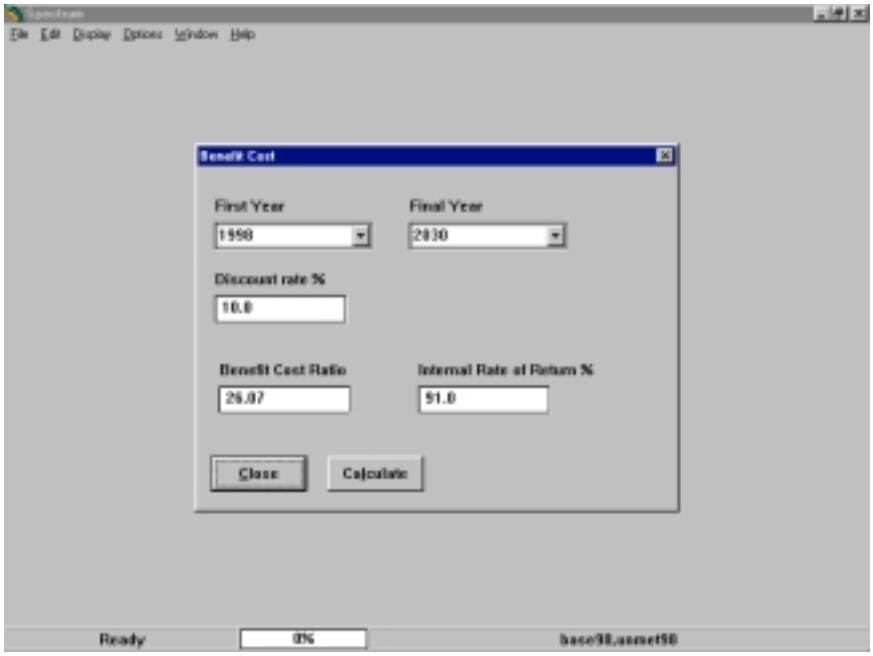
1. Choose "Display" from the menu bar.

2. Choose “Benefit-Cost” from the pull-down menu.

3. Click the “Cost and Benefits”.

4. Select “Benefit Cost”

The indicator below will appear:



G. Saving the Projection

It is always a good idea to save the projection whenever you make a change to any assumptions. To save the projection without changing the name, choose “File” from the menu bar and “Save projection” from the pull-down menu.

To save the projection with a different name, choose “File” from the menu bar and “Save projection as” from the pull-down menu. You will then have a chance to specify a new file name for the projection. Normally when you save the projection with a new name you should also change the projection title. This step will avoid confusion if you have both projections loaded at the same time.

H. Opening an Existing Projection

If you have already created a BenCost projection or are using a projection provided by someone else, you can immediately load that projection.

1. Select “File” from the menu bar.
2. Select “Open projection” from the pull-down menu.
3. Select the file you wish to use and click the “Ok” button to open the projection.

I. Closing a Projection

To remove a projection that has already been opened,

1. Choose “File” from the menu bar and
2. “Close projection” from the pull-down menu. If you have more than one projection loaded, you will be asked to select which projection should be closed.

Closing a projection just removes it from the active Spectrum session. It does not erase it from the hard disk. You can open that projection again at any time.

VII. Sample Application

This chapter describes a typical application of BenCost. It uses a data file with data from the Philippines for the years 1998 through 2030.[7] The data files are named Base98.pjn and Unmet98.pjn.

A. Goal

In this sample, the goal is to measure the benefit and the cost of meeting 100 percent of current unmet family planning need in 10 years. The BenCost model will allow us to see the costs, benefits, and ultimate financial value of taking this action.

B. Family Planning Scenarios

The population projections Base98.pjn and Unmet98.pjn are identical, with one key exception—they have different levels of unmet family planning need. Base98 assumes that there is a constant level of unmet family planning need in the population for the entire time span of the model. Unmet98 assumes that there is a degree of unmet family planning need in the initial year of the projection. However, this unmet need is addressed in the second year and is met at 100 percent by the eleventh year of the projection. This results in a lower population overall in the Unmet98 projection. BenCost combines this difference in population with the health, education, and other social sector cost data defined by the user, to illustrate the costs and benefits (savings) that can be realized in the future, if family planning programs are adjusted accordingly.

The sample application is fairly simple in scope, for purposes of clarity. Users may alter any of the family planning

[7] The Household headship data used in the sample application is not from the Philippines. It is provided for illustration purposes only. The presence of this data does not affect the outcome of the benefit-cost calculation in the sample application.

variables that will cause a resulting change in population in order to study the long-term cost effects on society.

Table 2 details the percentage of unmet family planning need in both projections.

Table 2: Percentage of Unmet Family Planning Need in First Year That Is Met

	Projection (%)	
Year	Base98	Unmet98
1998	0	0
1999	0	10
2000	0	20
2001	0	30
2002	0	40
2003	0	50
2004	0	60
2005	0	70
2006	0	80
2007	0	90
2008	0	100
2009	0	100
↓	↓	↓
2029	0	100
2030	0	100

C. Service Options

While FamPlan variables may be changed freely for either projection, the service options must be identical for both projections. Spectrum will not allow the user to load BenCost modules that have a different structure, even if the core population projections are identical.

The sample application uses a discount rate of 10 percent. For purposes of illustration, it contains data for the Education, Other Health, Other Social Services, and General Household service options. The names of these options are listed in Table 3.

Table 3: Service Options and Their Names

Service Option	Service Name 1	Service Name 2
Education	Primary School	Secondary School
Maternal Health	None	None
Child Health	None	None
Other Health	General Health	None
Other Social	Other Social Services	None
General Household	General Household	None

The household headship values used in both Base98.pjn and Unmet98.pjn are listed in Table 4.

Table 4: Household Headship Rates[8]

Age Group	Male	Female
15-19	3	1
20-24	16	4
25-29	44	7
30-34	65	10
35-39	80	13
40-44	86	17
45-49	92	19
50-54	92	22
55-59	94	23
60-64	89	24

D. Service Name Values

The values used in the BenCost module for both Unmet98.pjn and Base98.pjn are listed in Tables 5 through 8.

[8] See footnote number 6.

Table 5: Education Values

	Education Level	
Value	**Primary**	**Secondary**
Enrollment rate	90.7%	54.9%
Recurrent cost per student	2,421	2,308
Capital cost per student	0	0
Lower age limit	6	13
Upper age limit	12	17

Table 6: Other Health Values

General Health	1998	2030
Coverage rate	100.0%	100.0%
Recurrent cost per individual	173	173
Capital cost per individual	0	0
Lower age limit	0	0
Upper age limit	80	80

Table 7: Other Social Values

Other Social Services	1998	2030
Coverage rate	100.0%	100.0%
Recurrent cost per individual	529	529
Capital cost per individual	0	0
Lower age limit	0	0
Upper age limit	80	80

Table 8: General Household Values

General Household	1998	2030
Coverage rate	100.0%	100.0%
Recurrent cost per household	0	0
Capital cost per household	0	0

E. Results

BenCost provides many useful graphs and indicators that can be used to assess the value of a policy decision. For this sample we focus on the following key indicators:

- FamPlan cost
- Total social expenditure
- Marginal FamPlan cost
- Social sector savings
- Benefit-cost ratios
- Internal rate of return.

For the purposes of this sample data section, all Spectrum outputs are expressed as tables. Spectrum can also express these results in a variety of graphs and charts. All currency figures are in billions of 1995 U.S. dollars.

1. FamPlan Costs

Using the display menu options in Spectrum, we can see that the more intensive family planning efforts in the projection "Unmet98" will cost $4.98 billion rather than $3.93 billion under the less intensive projection, "Base98". These costs are represented in Table 9. Spectrum also allows us to view this information in terms of the marginal FamPlan costs, represented in Table 10.

Table 9: FamPlan Costs

Year	Projection		Percent difference
	Base98	Unmet98	
1998	0.66	0.75	-13.83%
2008	0.81	1.16	-42.58%
2018	0.99	1.34	-35.54%
2028	1.47	1.73	-17.70%
Total	3.93	4.98	

Table 10: Marginal FamPlan Costs

Year	Base98
1998	0.0912
2008	0.3460
2018	0.3525
2028	0.2602
Total	1.05

2. Total Social Expenditure and Savings

Using the display menu options in Spectrum, we can see that the reduced population that will result from the more intensive family planning efforts in the projection "Unmet98" will yield a social sector savings of $80.42 billion. This does not mean that actual spending should or will be reduced by this amount. Rather, the model demonstrates that under the more intensive family planning scenario, these savings would be available to invest in increasing the quality and availability of existing social service programs. These savings are represented in Tables 11 and 12.

Table 11: Total Social Expenditures

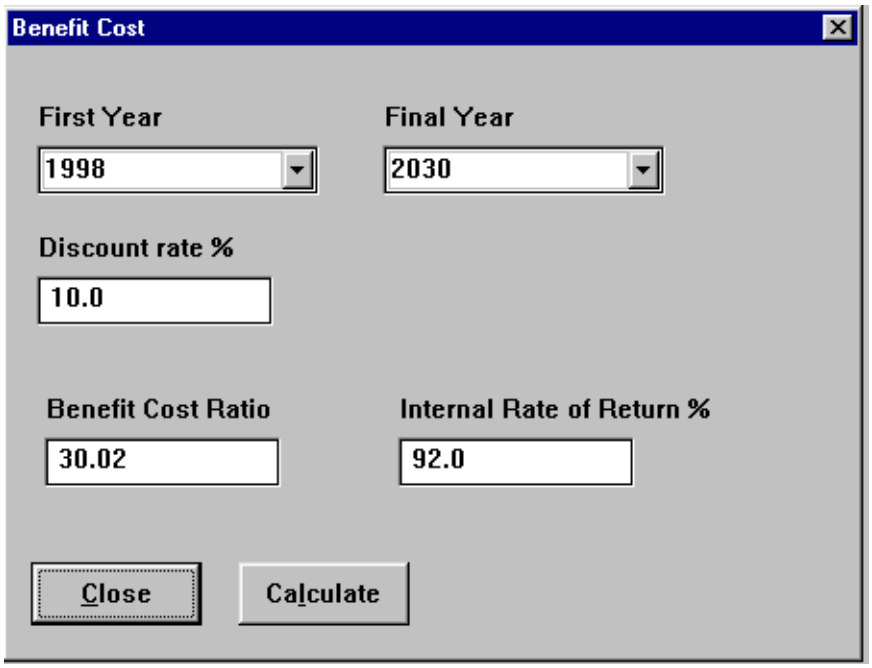
	Projection		Percent
Year	Base98	Unmet98	difference
1998	88.24	88.24	0.00%
2008	108.55	103.18	4.94%
2018	137.25	109.14	20.48%
2028	168.70	121.76	27.83%
Total	502.74	422.32	

Table 12: Social Sector Savings

Year	Base98
1998	0
2008	5.37
2018	28.11
2028	46.94
Total	80.42

3. Benefit-Cost Ratios and the Internal Rate of Return

The display indicator for benefit-cost ratios and the internal rate of return appear in a pop-up screen rather than as a chart or table. In this sample, a more intensive family planning effort with a goal of meeting all unmet family planning needs within 10 years will yield a benefit-cost ratio of 30.02 and an internal rate of return of 92 percent. Spectrum also allows the user to look at the return at various points in the projection. This is accomplished by changing the first and/or final year in the pop-up screen displayed below and then hitting the "calculate" button.



This analysis shows that attempting to meet all unmet family planning need within 10 years would be a worthwhile investment—that is, it would yield a positive return. In addition, BenCost provides a measurable number indicating how strong a return is generated.

F. Exploring Alternate Scenarios

The sample application illustrated a goal of meeting unmet need within 10 years. It can be instructive to study the effect under the following scenarios:

- The plan to intensify family planning efforts is postponed for 5 years. All unmet need is met at 100 percent in 2013. What are the effects on costs and benefits? What happens to the benefit-cost ratio?

- The plan to intensify family planning efforts is postponed for 5 years. In addition, a more modest increase is implemented. What are the cost and benefits if unmet need is reduced by 10 percent starting in 2003 and this 10 percent reduction is maintained for every year until 2030? What are the effects on costs and benefits? What happens to the benefit-cost ratio?

- How sensitive to changes in the interest rate (as measured by the discount rate) are the costs and benefits of the proposed change in family planning efforts? How does changing the discount level to 15 percent affect the cost and benefit measurements of the scenario above?

VIII. Projection Methodology

The following section describes the equations and techniques used in BenCost that underlie the model's projections. The mathematical form of the equations used within the model, as well as brief descriptions of each equation and its constituent variables, are provided.

The following subscripts and superscripts are used in the equations that shape the model's projections.

a	age
t	time (in years)
k	family planning scenario
h	high-intervention scenario
l	low-intervention scenario
b	education level
c	type of maternal health service
d	type of child health service
e	type of other health service
f	type of other social service
g	type of general household service
u	upper limit

A. Education

As described in Section IV C 2, the user has the option of specifying a simple education sector that has one to four levels. Equation 1 describes the potential student population for each of the education sector's levels:

[1] $$StudentPop_{b,t,k} = \sum_{a=a_b^l}^{a_b^u} (PopMale_{a,t,k} + PopFemale_{a,t,k}) \ ,$$

where a_b^l and a_b^u are the user-specified lower and upper age limit for each education level, *b.*

From this potential student population, the actual number of students enrolled within a given level is determined using an enrollment rate according to Equation 2:

[2] $$Students_{b,t,k} = (StudentPop_{b,t,k})(EnrolRate_{b,t,k}).$$

The level of recurrent expenditure for each level, *b,* is the product of the user-specified recurrent cost per student and the number of students:

[3] $$EduRecExp_{b,t,k} = (Students_{b,t,k})(EduRecCost_{b,t,k}).$$

Similarly, capital expenditure is the product of the user-specified capital cost of servicing a new student and the number of new students within the level, as shown in Equation 4:

[4] $$EduCapExp_{b,t,k} = (Students_{b,t,k} - Students_{b,t-1,k})(EduCapCost_{b,t,k}).$$

Total expenditure for each level, *b,* is the sum of recurrent and capital expenditure:

$$EduExp_{b,t,k} = EduRecExp_{b,t,k} + EduCapExp_{b,t,k}.$$

Total education expenditure is equal to the sum of total expenditure for each individual level of the education system, as shown in Equation 5:

[5] $$EduExp_{t,k} = \sum_{b} EduExp_{b,t,k}.$$

The savings in education expenditure for each level, *b,* are equal to the difference between education expenditure

under the low-intervention family planning scenario and under the high-intervention scenario:

[6] $$EduSavings_{b,t} = EduExp_{b,t,l} - EduExp_{b,k,h} \ .$$

The savings in education expenditure for all levels are equal to the sum of the savings for each individual level:

[7] $$EduSavings_t = \sum_b EduSavings_{b,t} \ ,$$

or, equivalently, the difference in total education expenditure between the low- and high-intervention family planning scenarios:

[8] $$EduSavings_t = EduExp_{t,l} - EduExp_{t,h} \ .$$

B. Health

The health sector is broken down into three areas: maternal health, child health, and other health services.

1. Maternal Health Services

Within the maternal health area, users have four service options. For each maternal health option, service provision is based on the number of pregnancies covered, a product of the user-specified coverage rate and the exogenous number of pregnancies. Equation 9 describes the number of pregnancies covered for each service:

[9] $$MHealth_{c,t,k} = (Pregnancies_{t,k})(MCoverage_{c,t,k}),$$

where $MCoverage_{c,t,k}$ is the user-specified coverage rate for maternal health service *c.*

Based on this measure of the number of pregnancies covered, the level of recurrent expenditure for each service, *c,* is the product of the number of pregnancies covered ($MHealth_{c,t,k}$)and the user-specified recurrent cost per pregnancy covered:

[10] $MHealthRecExp_{c,t,k} = (MHealth_{c,t,k})(MHealthRecCost_{c,t,k})$.

Similarly, Equation 11 describes the level of capital expenditure required to service new pregnancies covered by service *c* as the product of the number of new pregnancies covered and the capital cost of servicing a new pregnancy:

[11] $MHealthCapExp_{c,t,k} = (MHealth_{c,t,k} - MHealth_{c,t-1,k}) \bullet (MHealthCapCost_{c,t,k})$.

Total expenditure on maternal health service *c* is the sum of recurrent and capital expenditure:

[12] $MHealthExp_{c,t,k} = MHealthRecExp_{c,t,k} + MHealthCapExp_{c,t,k}$.

Equation 13 shows total expenditure on maternal health as the sum of expenditure on each individual maternal health service:

[13] $MHealthExp_{t,k} = \sum_{c} (MHealthExp_{c,t,k})$.

2. Child Health Services

The child health area of the model provides four service options. The number of children covered by each service is the product of the potential client population and the associated coverage rate, as described in Equation 14:

[14] $CHealth_{d,t,k} = (Children_{d,t,k})(CCoverage_{d,t,k})$.

The potential child client population is given by:

[15] $Children_{c,t,k} = \sum_{a=a_c^l}^{a_c^u} (PopMale_{a,t,k} + PopFemale_{a,t,k})$,

where a_d^l and a_d^u are the user-specified lower and upper age limit for each type of child health service, *d.*

Recurrent expenditure on each child health service option is equal to the product of the number of children covered by the service and the recurrent cost per child covered:

[16] $CHealthRecExp_{d,t,k} = (CHealth_{d,t,k})(CHealthRecCost_{d,t,k})$.

Similarly, Equation 17 describes the level of capital expenditure required to service new children covered by service d as the product of the number of new children covered and the user-specified capital cost of servicing a new child:

[17] $CHealthCapExp_{d,t,k} = (CHealth_{d,t,k} - CHealth_{d,t-1,k})(CHealthCapCost_{d,t,k})$.

Total expenditure on child health service *d* is the sum of recurrent and capital expenditure:

[18] $CHealthExp_{d,t,k} = CHealthRecExp_{d,t,k} + CHealthCapExp_{d,t,k}$.

Equation 19 shows total expenditure on child health as the sum of total expenditure on each individual child health service:

[19] $CHealthExp_{t,k} = \sum_{d}(CHealthExp_{d,t,k})$.

3. Other Health Services

The other health services area of the model offers four service options. The number of individuals covered by each service is the product of the potential client population and the associated user-specified coverage rate:

[20] $OHealth_{e,t,k} = (Clients_{e,t,k})(OCoverage_{e,t,k})$,

where the potential client population is given by:

$$[21] \quad Clients_{e,t,k} = \sum_{a=a_e^l}^{a_e^u} (PopMale_{a,t,k} + PopFemale_{a,t,k}) \ ,$$

and where a_e^l and a_e^u are the user-specified lower and upper age limit for each type of other health service, *e.* Recurrent expenditure on each other health service option is equal to the product of the number of clients covered by the service and the recurrent cost per client covered:

$$[22] \quad OHealthRecExp_{e,t,k} = (OHealth_{e,t,k})(OHealthRecCost_{e,t,k}) \ .$$

Similarly, Equation 23 describes the level of capital expenditure required to service new individuals covered by service *e* as the product of the number of new individuals covered and the user-specified capital cost of servicing a new individual:

$$[23] \quad OHealthCapExp_{e,t,k} = (OHealth_{e,t,k} - OHealth_{e,t-1,k})(OHealthCapCost_{e,t,k}) \ .$$

Total expenditure on other health service *e* is the sum of recurrent and capital expenditure:

$$[24] \quad OHealthExp_{e,t,k} = OHealthRecExp_{e,t,k} + OHealthCapExp_{e,t,k} .$$

Equation 25 shows total expenditure on other health services as the sum of total expenditure on each individual other health service:

$$[25] \quad OHealthExp_{t,k} = \sum_{e} (OHealthExp_{e,t,k}) \ .$$

4. Total Health Services Expenditure and Savings

Total expenditure on health services is equal to the sum of total expenditure on maternal health, child health, and other health services, as described in Equation 26:

$$[26] \quad HealthExp_{t,k} = MHealthExp_{t,k} + CHealthExp_{t,k} + OHealthExp_{t,k} .$$

The savings in health sector expenditures attributable to the high-intervention family planning program are equal to the difference between total health expenditures under the low-intervention family planning program and under the high-intervention program.

[27] $HealthSavings_t = HealthExp_{t,l} - HealthExp_{t,h}$.

C. Other Social Services

Within the other social services area of the model, the user has the option of specifying four services. For each of these services, indexed by the subscript *f,* the number of individuals receiving the service is a function of the population group eligible for the service, described in Equation 28:

[28] $$PopGroup_{f,t,k} = \sum_{a=a_f^l}^{a_f^u} (PopMale_{a,t,k} + PopFemale_{a,t,k}) ,$$

where a_f^l and a_f^u are the user-specified lower and upper age limit for each social service, *f.* From this potential client population, the actual number of individuals served is determined using a coverage rate according to Equation 29:

[29] $People_{f,t,k} = (PopGroup_{f,t,k})(PCoverage_{f,t,k})$.

The level of recurrent expenditure for each level, *f,* is the product of the user-specified recurrent cost per client serviced and the number of clients:

[30] $SocialRecExp_{f,t,k} = (People_{f,t,k})(SocialRecCost_{f,t,k})$.

Similarly, capital expenditure is the product of the user-specified capital cost of servicing a new client and the number of new clients, as shown in Equation 31:

[31] $SocialCapExp_{f,t,k} = (People_{f,t,k} - People_{f,t-1,k})(SocialCapCost_{f,t,k})$.

Total expenditure for each service, *f,* is the sum of recurrent and capital expenditure:

[32] $SocialExp_{f,t,k} = SocialRecExp_{f,t,k} + SocialCapExp_{f,t,k}$.

Total other social service expenditure is equal to the sum of total expenditure for each individual service, as shown in Equation 33:

[33] $SocialExp_{t,k} = \sum_{f} SocialExp_{f,t,k}$.

The savings in expenditure for each level, *f,* are equal to the difference between expenditures under the low-intervention family planning intervention scenario and under the high-intervention scenario:

[34] $SocialSavings_{f,t} = SocialExp_{f,t,l} - SocialExp_{f,k,h}$.

Total savings across all other social services are equal to the difference in total social service expenditure across the low- and high-intervention family planning scenarios:

[35] $SocialSavings_{t} = SocialExp_{t,l} - SocialExp_{t,h}$.

D. General Household Services

In addition to the range of services described above that are provided to individuals, the model also includes options for general services that are provided to households. Modeling such services, which might include sewerage or electrification, requires first determining the total number of households. This task is accomplished using the household headship rate method, described in Section IV C 8 and in Equation 36:

[36] $Households_{t,k} = \sum_{i} (h_i^{male} SubPopMale_{i,t,k} + h_i^{female} SubPopFemale_{i,t,k})$,

where h_i, the headship rate, is the gender-specific percentage of a given subpopulation group *i* who are household heads, and where the subpopulation groups are defined as 5-year age groups ranging from 15-19 to 60-64.

For each of the four possible household services, *g,* coverage rates are applied to the number of households to determine the number of households receiving the service:

[37] $General_{g,t,k} = (Households_{t,k})(HCoverage_{g,t,k})$.

The level of recurrent expenditure for each service is the product of the user-specified recurrent cost per household served and the number of households served:

[38] $GeneralRecExp_{g,t,k} = (General_{g,t,k})(GeneralRecCost_{g,t,k})$.

Similarly, capital expenditure is the product of the user-specified capital cost of servicing a new household and the number of new households, as shown in Equation 39:

[39] $GeneralCapExp_{g,t,k} = (General_{g,t,k} - General_{g,t-1,k})(GeneralCapCost_{g,t,k})$.

Total expenditure for each service, *g,* is the sum of recurrent and capital expenditure:

[40] $GeneralExp_{g,t,k} = GeneralRecExp_{g,t,k} + GeneralCapExp_{g,t,k}$.

Total general household service expenditure is equal to the sum of total expenditure for each individual service, as shown in Equation 41:

[41] $GeneralExp_{t,k} = \sum_{g} GeneralExp_{g,t,k}$.

The savings in expenditures for each level, *g,* are equal to the difference between expenditures under the low-intervention family planning intervention scenario and the under high-intervention scenario:

[42] $GeneralSavings_{g,t} = GeneralExp_{g,t,l} - GeneralExp_{g,k,h}$.

Total savings across all household services are equal to the difference in total social service expenditure across the low- and high-intervention family planning scenarios:

[43] $GeneralSavings_{t} = GeneralExp_{t,l} - GeneralExp_{t,h}$.

E. Summary Expenditure and Benefit-Cost Measures

Total expenditures across all service sectors are equal to the sum of spending on education, health, other social services, and general household services, as shown in Equation 44:

[44] $TotalExp_{t,k} = EduExp_{t,k} + HealthExp_{t,k} + SocialExp_{t,k} + GeneralExp_{t,k}$.

The marginal cost of the high-intervention family planning program is equal to the difference between family planning program spending under the high- and low-intervention scenarios, as described in Equation 45:

[45] $MarCost_{t} = NetExpenditures_{t,h} - NetExpenditures_{t,l}$.

The annual savings (MarExp) in each year under the high-intervention scenario are equal to the difference between expenditures under the low-intervention scenario and under the high-intervention scenario:

[46] $MarExp_{t} = TotalExp_{t,l} - TotalExp_{t,h}$.

Equations 47 and 48 show the calculation of discounted family planning program marginal cost and discounted annual savings in service provision expenditures, respectively:

[47] $DisMarCost_{t} = \frac{MarCost_{t}}{(1+r)^{t-1}}$,

[48] $$DisMarExp_t = \frac{MarExp_t}{(1+r)^{t-1}},$$

where r is the discount rate.

The benefit-cost ratio of the high-intervention family planning program is equal to the ratio of the sum of the discounted service provision savings (benefits) to the sum of the discounted marginal cost of the high-intervention family planning program:

[49] $$BenCostRatio_t = \frac{\sum_{t=x_b}^{z_b} DisMarExp_t}{\sum_{t=x_c}^{z_c} DisMarCost_t},$$

where x_b and z_b are the initial and final year in which benefits of the family planning program are measured, and x_c and z_c are the initial and final year in which costs of the family planning program are measured.

The model also calculates the internal rate of return of the high-intervention family planning scenario—the value of the discount parameter which equates the sum of the stream of discounted costs to the sum of the stream of discounted benefits.

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X. Glossary of Terms

Some of the following terms were obtained from the Population Reference Bureau's *Population Handbook* (1989); others were adapted from the International Union for Scientific Study of Population's (IUSSP's) *Multilingual Demographic Dictionary* (Van de Walle and Henry, 1982); still others are definitions employed by the Demographic and Health Surveys program executed by Macro International. These terms are defined in the context of their use within BenCost.

Aggregation. A group of elements to be considered as a whole, such as women of reproductive age.

Amortize. To account for, or realize, the cost of an item over a fixed period of time. This accounting principle is used to allow companies or entities to spread the cost of an expensive item over some period of time.

Base year. In a projection model based on actual social sector data from a given country or set of countries, the base year typically is the most recent year for which all necessary sectoral data are available. For a projection model that deals with population issues or one that is based on population projections, the base year typically is the first year of the model's population projections.

Baseline demographic projection. A Spectrum projection that keeps unmet family planning need constant for the duration of the model. In BenCost, the level of residual unmet need is used to calculate future population growth and the cost of impacts to social and health programs that are population dependent.

Births. The number of live births occurring during a year.

Benefits. In BenCost, benefits are defined as savings realized from offering public sector services to a smaller population.

Capital cost. The cost of expensive items that are often amortized over a period of several years. The costs of new schools, clinics, and expensive machinery are often referred to as capital costs. BenCost requires the capital cost per participant for each social program that users include in their projection.

Coverage rate. The percentage of individuals from a given population subgroup who are covered by a given service option in a BenCost projection. The upper and lower age ranges that define a population subgroup are set by the user for most service options in BenCost. For a service that is offered to males and females between the ages of one and five, specifying a coverage rate of 23 percent, for example, would mean that 23 percent of all people in this range would receive this service. Values must be between 0 and 100 and should be entered without the percent sign.

Dialogue box. A box (shown on the computer screen) permitting users to choose among a limited number of options. The box is accompanied by text elaborating on those options.

Discounting. The process of accurately estimating the value of future economic returns in terms of current prices or currency values.

Disaggregation. A group of elements broken down into subsets, such as a population broken down into single-age categories (ages 1, 2, 3, etc.)

Effectiveness. Effectiveness is the extent by which a contraceptive method lowers the chances to become pregnant in a given month. This measure depends both on the ability of women to conceive and on the method's failure rate.

Economic benefit-cost analysis. A type of economic analysis that measures the benefit of a national family planning program in terms of the contribution it makes in improving the per capita income of the country. This is **not** the method used in the Spectrum BenCost model.

Financial benefit-cost analysis. Also known as public benefit-cost analysis; a type of economic analysis where benefits are defined as savings realized from offering public sector

services to a smaller population, generally as a result of more intensive family planning efforts. This is the type of analysis employed by the Spectrum BenCost model.

Gross cost. The total public sector cost of providing family planning services.

High-intervention scenario. The name given to the population projection used in a BenCost analysis where the desired level of family planning need is met at some point within the projection timeframe.

Internal rate of return (IRR). the value of the discount parameter expressed as a percentage, which equates the sum of the stream of discounted costs to the sum of the stream of discounted benefits. Used to measure the value of an investment. An IRR of 0 would indicate no return on investment.

Interpolation. Given two numbers that serve as boundary points, the estimation of values that lie at intervals between the two points. For example, if the total fertility rate (TFR) for a country or region was actually measured only in 1980 and in 1995, by assigning a relationship between the values from year to year, it is possible to estimate a TFR for each intervening year. (Spectrum uses a linear form of interpolation so that the difference between each annual value is the same. Other nonlinear forms of interpolation also are possible, but are not used in Spectrum.)

Interpolation period. The numerical difference between the base year and the target year—the number of years over which parameter changes in a BenCost projection occur.

Low-intervention scenario. The name given to the population projection used in a BenCost analysis where the level of unmet family planning need remains constant.

Model. Computer system designed to demonstrate the probable effect of two or more variables that might be brought to bear on an outcome. Such models can reduce the effort required to manipulate these factors and present the results in an accessible format.

Module. Synonym for "model".

Net cost. The net public sector cost of family planning services. This figure is equal to gross cost minus revenue collected.

Normalization. The transformation of a series of data points into a percent distribution summing to 100 percent.

Pop-up menu. A menu (shown on the computer screen) from which users can select items or actions. Pop-up menus can appear anywhere on the screen.

Public benefit-cost analysis. Also known as financial benefit-cost analysis; a type of economic analysis where benefits are defined as savings realized from offering public sector services to a smaller population, generally as a result of more intensive family planning efforts. This is the type of analysis employed by the Spectrum BenCost model.

Pull-down menu. A menu (shown on the computer screen) opened by clicking on key words at the top edge of the screen. Pull-down menus allow users to select operations.

Radio button. These buttons (shown on the computer screen) emulate raised buttons on early radios, which were punched to select radio stations. The graphically portrayed raised "radio buttons" on interfaces permit users to select among at least three alternatives.

Recurrent cost. An expense that is incurred every time a service is offered. It is a flexible category that allows users to account for costs such as medical supplies or school uniforms. BenCost requires the recurrent cost per participant for each social program that users include in their projection.

Revenue. The total amount of revenue collected from fees for family planning services.

Service Name. A specific service or program under the broader categories known as Service Options. There are allowed up to four service names per service option.

Service Option. Broad categories of health and social service sector indicators that will be affected by a change in the population growth rate. Examples are education, maternal health, and child health. They can be broken down into more specific programs called Service Names.

Target year. The final year for which the model carries out parameter changes specified by the user. Equivalently, one can think of the target year as the year in which all parameters reach their target values.

Total fertility rate. The average number of children that would be born alive to a woman (or a group of women) during her lifetime if she were to pass through all her childbearing years conforming to the age-specific fertility rates of a given year.

Unmet family planning need. Refers to the total number of couples who presumably should be using contraception based on their fertility desires and susceptibility to a pregnancy, but are not using contraception. The BenCost model illustrates the savings that can be realized if the amount of unmet family planning need is reduced or eliminated.

XI. Acronyms and Abbreviations

CYP	couple-year of protection
DHS	Demographic and Health Survey
IRR	Internal rate of return
NGO	nongovernmental organization
TFR	total fertility rate
UN	United Nations
USAID	United States Agency for International Development

Appendix A: Supplemental Instructions for Creating a Baseline Projection

The FamPlan module of the Spectrum software calculates future population growth resulting from various family planning scenarios. The BenCost module requires two population projections with different family planning scenarios. To achieve the best results, it is often helpful to begin with two identical population and family planning projections. This allows the user to alter one family planning variable at a time to see the overall effect on the size of the population in the future. Depending on the particular "what if?" statement that the user is attempting to answer, Spectrum does allow users to change more than one variable at a time.

The best way to ensure that both projections are identical is to copy an existing Spectrum projection immediately prior to beginning a BenCost projection. Steps needed to accomplish this are detailed below.

Open the first projection:

1. Select "File" from the menu bar.
2. From the pull-down menu that appears, select "Open projection".
3. Select the projection file from the "Open" dialogue box and press "Ok". All pre-existing projections that can be loaded will be listed here.

Make a duplicate projection:

1. Select "File" from the menu bar.
2. From the pull-down menu that appears, select "Save Projection As".
4. Type the name of the new file in the "File Name" box. Note: it is recommended that the new name be

somehow associated with the name of the initial projection.

5. Press “Ok”.

The duplicate projection will now be open. You must reopen the initial projection to proceed with the BenCost analysis.

Note: You may now change family planning parameters within either projection; however, both projections must have the same active modules selected. For example, if BenCost is selected in your initial projection, it must be selected in your duplicate projection.

Registration

If you have not already registered your copy of Spectrum, please take a moment to complete this form and return it to us. This will ensure that you receive information about future updates to Spectrum.

Name: _____ Title: _____

Institution: _____

Address: _____

City: _____

State or District: _____ Postal Code: _____

Country: _____

Telephone number: _____ Fax Number: _____

E-mail address: _____

Do you have access to the internet?_____

Spectrum version number: _____

What type of computer are you using with Spectrum? _____

How large is your hard drive disk?_____

What kind of printer are you using? _____

What language are you using with DemProj?

English _____ Spanish _____ French _____ Other _____

How do you plan to use Spectrum? _____

_____

_____

What additions to Spectrum would you like to see? _____

_____

Additional Comments:_____

_____

Please return this form to:

Registration Department
The POLICY Project
The Futures Group International
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